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ASARCO LLC - TACOMA OCF

As-Built Report

December 2005

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December 2005

WOMACK & ASSOCIATES, INC. • Engineers and Geoscientists
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• Geotechnical Engineering • Geology

December 30, 2005

Mr. Thomas L. Aldrich
Asarco LLC
5219 North Shirley St.
Ruston, WA 98407

Re: Tacoma Smelter OCF As-Built Report

Dear Mr. Aldrich:

Attached please find six copies of the As-Built Report for the Tacoma Smelter Onsite Containment Facility (OCF). The report is based upon surveys, test data, and observations provided by others during the period of construction between 1999 and 2005, as well as observations and design engineering performed by this office.

In my opinion as a Professional Engineer licensed in the State of Washington, the enclosed report constitutes a reasonable representation of existing conditions and the methodology by which the OCF was constructed. In my opinion, based on my own observations and information provided by others, the construction of the OCF meets or exceeds the specifications in the approved closure plan.

Respectfully submitted,

Wesley Raymond Womack 12-30-05

WESLEY RAYMOND WOMACK
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

Wesley Raymond Womack, P.E.
Enc: OCF as-built report (6 copies)

Expires 8/17/07

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ASARCO LLC - TACOMA OCF

As-Built Report

December 2005

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1.0 Introduction

The Onsite Containment Facility (OCF) was constructed as part of remedial activities (RA) for the Tacoma Smelter Site Operable Unit 02 (Asarco Tacoma Smelter – "Upland") remediation. Requirements for the design, construction, and closure of the OCF are described in the following documents:

- Record of Decision Commencement Bay Nearshore/Tideflats Superfund Site Operable Unit 02. Asarco Tacoma Smelter Facility Ruston and Tacoma, Washington (March 1995).
- Final Statement of Work for the Commencement Bay Nearshore/Tideflats Superfund Site Operable Unit 02 – Asarco Tacoma Smelter Facility and Peninsula Remedial Design and Remedial Action (February 16, 1996).

Construction activities began during 1999 and the final cover was completed during 2005. This As-Built Report presents a summary of the final configuration based on surveys and other information compiled during the duration of the project. As-built plans and details for all phases of the construction are presented on attached Figures 1 through 15. Other documentation including construction photos, summaries of construction quality control tests, and material specifications for geosynthetics are presented as appendices to the report.

2.0 Project Overview

The following sections present a summary of the construction contractors, construction sequence, and Construction Quality Assurance (CQA) and Quality Control (QC).

2.1 Construction Contractors

The general contractor for construction of the OCF and placement of Source Area (SA) backfill in the OCF was Envirocon, Inc., headquartered in Missoula, Montana. Envirocon provided on-site personnel and heavy equipment for construction of earthworks and other components of the OCF including site preparation, embankment construction, Compacted Soil Liner (CSL) placement, installation of geotextiles and drainage nets, installation of the Leachate Collection Removal System (LCRS), installation of the Leachate Detection Collection Removal System (LDCRS), vault installation, SA Backfill, cover drainage system, and cover soil placement.

Other contractors and subcontractors involved the construction included:

Contractor/Subcontractor	Construction Activity
Northwest Lining and Geosynthetic Products, Inc. (NWL), Kent, Washington	Installation of the bottom and cover lining systems.
Hayward Baker, Geotechnical Construction, Seattle Area Office, Tukwila, Washington	Deep dynamic compaction for the OCF embankment foundation.
Geotechnics America Inc. (GTA), Peachtree City Georgia	Wick drain installation in OCF foundation. Subcontractor to Hayward Baker.
Custom Electronic & Controls, Fife, Washington	Installation of electrical service and instrumentation for the LCRS and LDCRS systems.
Hydrometrics Construction Group	Foundation stripping and preparation.

2.2 Construction Sequence

Construction of the OCF began with site preparation during 1999. Final placement of the cover system was completed during the fall of 2005. The following table summarizes the period of construction for each of the major OCF components:

OCF Component	Construction Period
Demolition and Stripping	June-July, 1999
Ground Improvement	August – September 1999
Embankment Placement	Summer 2000
CSL Placement	The majority of the CSL was placed during the 2000 and 2001 construction seasons. CSL was placed below the temporary north ramp (after removal) during 2003.
Bottom Liner System	Installation of the bottom liner system began during 2001 construction season and was completed in the North Ramp Area during 2003.
Access Ramp Construction	The permanent ramp located at the south west corner of the OCF was constructed during the fall of 2003.
SA Backfill	2003, 2004, and final grading and placement of cover liner subgrade layer during 2005 construction season.
Cap Drainage System	The cap drainage system manholes and drainage lines were install during the fall of 2004. Final grade was set on the manholes during construction of the cover liner system in the fall of 2005. The outfall MH-11 and drain line down the east side of the OCF berm was installed during the fall of 2005.
Cover Liner System	Cover construction was completed during the fall of 2005.
Leachate Collection System	The LCRS and LDCRS sumps were constructed during placement of the bottom liner system (during 2001 and 2003). Gravel backfill was placed along the LCRS riser pipe during 2003 and 2004 as the level of the SA backfill increased within the cell. This allowed access to place the granular backfill in the trench going up the 3H:1V slope. Installation of pump controls and the vault alarm system was completed during 2005.

Construction of the LDCRS and LCRS drain layers required access into the cell bottom during installation of the bottom liner system. A temporary access ramp was constructed on the north side of the cell for haul truck access. The CSL and bottom liner system was completed in two phases to allow construction access. The bottom liner placed during the first phase of construction excluded the area beneath the north ramp alignment. Once the bottom liner system was completed within the interior and southern portion of the cell, a permanent ramp was constructed from the bottom of the cell up to the southwest corner of the cell. The temporary north ramp was then removed and the CSL and bottom liner system were completed at the north end of the cell.

2.3 Construction CQA and QC

Specific Performance Standards for the OCF are addressed in the Performance Standards Verification Plan (Hydrometrics, September 1998). The Performance Standards required establishment of a Construction Quality Assurance (CQA) program to ensure that the constructed cover meets or exceeds all design criteria and specifications in accordance with 40 CFR 264.19. The Construction Quality Assurance Program (CQAP) along with the Construction Quality Assurance Project Plan (CQAPP) and Plans and Specifications for PA 1.0 constitute the CQAP.

The overall requirements for inspection and quality assurance of the OCF components, as defined in this CQAP and the Plans and Specifications for PA 1.0, were the responsibility of the Supervising Contractor (Hydrometrics, Inc.) with oversight and approval by the Independent Quality Assurance Team (IQAT). The IQAT team consisted of Hydrometrics personnel not involved in the remedial design or construction oversight for the OCF. During construction of the OCF cover, the role of Supervising Contractor was provided by Asarco Consulting, Inc. (ACI) and their subcontractor Womack & Associates Inc. (Billings, Montana).

Construction QC requirements are described in detail in the project specifications and were the responsibility of the Engineering Inspector (Hydrometrics and subconsultants). The project specifications describe the majority of QC measures, and when taken together with CQAP and the CQAPP, form a complete set of Construction Quality Control (CQC) requirements. Requirements and responsibilities regarding construction QC are further addressed in Section 2 of the CQAP and in the CQAPP.

Construction Quality Assurance (CQA) testing of geosynthetic materials was performed by Precision Geosynthetic Laboratories (Anaheim, California). Results from CQA tests have been compiled in a set of tables in the CQAP that are reproduced in Appendix B.

During construction of OCF embankment and Compacted Soil Liner (CSL), QC testing included compaction testing, lift height monitoring, and monitoring of bentonite amended soil. Compaction, materials sampling, and testing were completed by Hydrometrics and HWA Geosciences (Lynnwood, Washington).

During installation of the bottom and cover liner components, on-site quality control tests completed by NWL (the installer) consisted of 100% non-destructive seam testing. Destructive test samples obtained from seams were divided into thirds. The first third was tested on-site by NWL. The second third was submitted to a third party laboratory contracted by the installer. The third sample was retained by Asarco and archived or tested if required.

3.0 Construction

The following sections provide a summary of the work completed during construction of each component of the OCF. Each section provides a description of any significant modifications that were made to the original design. As-built figures are referenced for each OCF component to illustrate modifications.

3.1 Site Preparation

Preparation of the OCF site included demolition of old facilities, -remediation of the site, and ground improvement to the OCF embankment foundation. Photos from construction activities during 1999 (Appendix A) present activities during site preparation.

3.1.1 Demolition and Remediation

Demolition of existing facilities included removal of several buildings and numerous old building foundations. Asphalt and gravel surfacing in parking areas and roadways was stripped and stockpiled outside the construction area. Foundations were removed and stockpiled outside of the construction area. Overhead and underground utilities within the OCF construction footprint were either removed during excavation or abandoned in-place by plugging or capping. Utilities included storm drains, water lines, overhead power, and sanitary sewer. The Deep Dynamic Compaction Report (Hydrometrics, April 2000) presents locations of abandoned utilities; demolition of buildings and foundations; and stripping of pavement areas.

During the spring of 1999, 78 surface soil samples and 3 borehole samples were collected within the OCF construction site. The samples were evaluated in accordance with the requirements of the Ruston Sampling and Analysis Plan (Hydrometrics, 1994) using XRF methods to assess the remediation of contaminated soil from the OCF construction site. A data validation report prepared by Hydrometrics (June, 2000) that presents the results from the XRF testing is attached in Appendix C.

3.1.2 OCF Foundation Ground Improvement

Ground improvement of the OCF embankment foundation included removal of non-engineered fill, installation of wick drains, and Deep Dynamic Compaction (DDC) within areas identified as susceptible to liquefaction (see Figure 2). DDC was performed by Hayward Baker and wick drains were installed by GTA (a subcontractor to Hayward Baker). Three level pads were constructed across the ground improvement area to accommodate installation of wick drains and DDC. Baseline geotechnical borings were completed in two areas for evaluating effectiveness of ground improvement activities. A gravel blanket drain was placed across the entire ground improvement area for seepage collection. The completion of the ground improvement program is documented in the Ground Improvement As-Built Report (Hydrometrics, April 2000).

Prior to installation of the Prefabricated Vertical Drains (PVD), a granular drainage blanket was placed across the area to be improved. PVD were installed by GTA using a vibratory stitching unit capable of advancement to a depth of 40 feet below ground surface. The wick drain material included a total of 32,571 feet of Amerdrain 410. PVDs were installed on a six foot by six foot spacing (triangular pattern) across the DDC area and an area along the southeast side of the OCF (see Figure 2). Installation depths ranged from 15 to 31 feet below the ground surface.

DDC was completed using an American 9299 crawler crane with a 75-foot drop height and an 18.5-ton weight. Based on test section results, a 50 to 60-foot drop height was selected and a 20-foot grid spacing was used for primary, secondary, and tertiary drop points. A total of ten drops were completed at each location. Details for the test program, drop heights, drop locations, and deflections are documented in the Ground Improvement As-Built Report.

Pre and post compaction borings (eight locations) were completed in test locations to evaluate the effectiveness of the DDC. These boring generally indicated high improvement between 5-10 feet and low improvement below 10 feet. The Ground Improvement As-Built Report concluded that intent of the ground improvement plan was accomplished based on the DDC results and soil removal beneath the OCF foundation.

3.1.3 OCF Foundation and Slope Drains

Foundation drains were installed in locations where seepage was encountered in the OCF foundation (see Figure 3). The drains consisted of a 6 inch diameter perforated ADS pipe placed in an envelope of minus 2.5-inch gravel.

Slope drains were installed in the 3H:1V slope on the western side of the OCF cell (see Figure 3). The drains consisted of 12-inch geocomposite drains (Amerdrain 702) placed in sand layers within trenches excavated below the bottom liner Compacted Soil Layer (CSL). The drains were typically spaced on 25-foot centers across the slope and connected to a 6-inch slotted subdrain collector pipe along the lower extent of the drains. The collector drain was routed to discharge seepage to the surface in the locations illustrated on Figure 3.

3.2 Embankment and Cell Construction

The core of the OCF embankment was constructed using common borrow imported to the site on barges by Glacier Northwest. The embankment fill was off-loaded from the barges using a conveyor system and hauled to the site in trucks. During placement of the fill it was determined that constructability of the finished slope was problematic due to the lack of fines in the imported fill. An enhanced fill material was then produced by Glacier Northwest by blending 10 percent crusher fines with the common borrow. This material was placed on the interior and outboard slopes and above the 40-foot berm elevation.

The original embankment design was modified as follows:

- The western edge of the OCF cell (along Bennett Street) was shifted 7 feet to the east from the original design location. This change was required to provide a working bench along the western edge of the cell for construction access and installation of the liner system anchor trenches.
- The embankment elevation along the eastern side of the OCF was reduced in elevation approximately 5 feet. This change was implemented to reduce the disposal capacity within the cell due to a reduction in the anticipated source area soil volumes.
- The exterior embankment slopes were reduced from the design slope angle (2H:1V) to approximately 2.5H:1V. This change was made to accommodate the reduced embankment height. The reduced slope angle also increased the workability of the low-fine-content embankment fill.

Figure 4 presents the as-built topography of the OCF embankment and cell subgrade.

3.3 Bottom Liner System

The bottom liner consists of a double composite liner system with drainage layers for the LCRS and LDCRS.

3.3.1 Bottom Composite Liner

The bottom composite liner consists of 3 feet of CSL and a Double Sided Textured (DST) 60-mil HDPE geomembrane.

The CSL was produced on site using a pug mill to mix imported borrow material having a minimum fine content of 25% with 8% granular sodium bentonite. The pug mill was operated by Envirocon. The bentonite was supplied from Wyoming by CETCO (Colloid Environmental Technologies Company). The CSL was compacted in six-inch thick lifts. In order to track CSL placement and testing, the OCF cell was divided into test panels. Monitoring in each panel included compaction, thickness, and permeability, based on the testing frequency specified in the monitoring plan. Results from CSL testing are summarized in the CQAP tables (see Appendix B), as follows:

- Table 4-1 Testing of soil and bentonite prior to mixing
- Table 4-4 Testing of soil and bentonite mixture prior to compaction
- Table 4-5 Testing of soil bentonite mixture after compaction
- Table 4-6 Construction Quality Assurance of low permeability liner placed in 2000

The DST 60-mil HDPE membrane was manufactured by Serrot International, Inc. QA testing was completed on samples based on the frequencies specified in the project specifications. Results of the QA tests are presented in the CQAP report (Table 6-1: Quality Assurance tests for flexible membrane liner). Test data indicate that the samples collected from materials delivered to the site meet or exceed the minimum project requirements.

Details for the bottom liner system components are presented on Figures 5 and 6. Serrot material data sheets for the liner membranes are presented in Appendix F.

3.3.2 LDCRS Layer

A LDCRS layer consisting of geocomposite drainage net was placed over the bottom composite liner. A 16-ounce per square yard non-woven cushion geotextile was placed across the bottom of the cell between the geomembrane and the drain material. The drainage net (Tex-Net TN 3002/1635) was manufactured by Serrot International, Inc. The drainage net was anchored in the bottom liner system anchor trench along with the other bottom liner system components and installed from the top of the slope. The drainage net was placed over the entire surface of the 3H:1V slopes of the cell and extended a minimum of 18 inches into the bottom of the cell. A 12-inch thick layer of drain material was placed across the cell bottom to complete the drainage layer to the LDCRS sump.

A 12-ounce per square yard non-woven geotextile was placed over the drain material in the cell bottom for separation with the CSL. A 6-ounce per square yard separation geotextile was specified for this layer. However, the 12-ounce fabric was available at the site and was approved for substitution in the LDCRS system.

The geocomposite layer combined with the drain material in the cell bottom provided a continuous drainage layer to the LDCRS sump. Details for the LDCRS layer are presented on Figures 6 and 7.

3.3.3 Upper Composite Liner

The upper composite liner placed on the 3H:1V slopes consisted of a 60-mil DST HDPE geomembrane placed over a Geosynthetic Clay Liner (GCL). The geomembrane was supplied by Serrot and the GCL is Bentomat DN manufactured by CETCO.

A 12-inch thick layer of CSL was placed in the cell bottom over the 12-ounce separation geotextile at the top of the LDCRS. During construction the configuration of the GCL in the cell bottom was revised from the original design and the GCL on the slopes was extended across the cell bottom above the CSL (see Figure 6). In the original design, the GCL was terminated in the cell bottom (18-inch overlap) and the CSL was placed above the GCL.

The geomembrane and GCL layers were installed continuously across the cell slopes and bottom and are anchored in the perimeter anchor trench along with the components for the lower composite liner. Details for the upper composite liner layer are presented on Figure 6. CQAP Table 7.1 in Appendix B includes results from GCL testing.

During August 21 through 23, 2001, a rain storm occurred during installation of the upper liner components resulting in flooding in the cell bottom and wetting of GCL. Water in the cell bottom was removed using portable pumps and discharged to the on-site stormwater system. GCL exposed to the flooding became hydrated and was replaced.

Further investigation of the conditions indicated that wetting had also occurred beneath the bottom liners resulting in saturation and damage to the surface of the CSL below the membranes. This occurrence required removal and replacement of the damaged CSL material. A report documenting the details of this event and the repairs to the liner system is presented in Appendix D.

3.3.4 LCRS Layer

The LCRS layer was constructed using the same materials as the LDCRS layer including the cushion geotextile, drain material, and separation geotextile. The geocomposite drainage net was anchored along with the other bottom liner system components in the perimeter anchor trench. The anchor trench was backfilled once the drainage net was installed.

The LCRS provides a continuous drainage layer across the slopes and cell bottom and drains to the low point at the LCRS sump. Details for the LCRS layer are presented on Figures 6 and 7.

3.4 LCRS/LDCRS System

The LCRS and LDCRS layers described above provide drainage to sumps in the cell bottom. Leachate removal is accomplished using horizontal pumps installed through sloped riser pipes accessed from Vault # 1 located on the south side of the OCF berm. Vault # 1 contains the pumping controls, flow meters, and piping manifold for the LCRS and LDCRS systems (see Figures 7 and 8). Flow measurements are recorded for leachate pumped from each sump. Then the flow is combined in a common discharge pipe that drains the leachate to Vault # 2. A 1,200-gallon polyethylene leachate storage tank is located in Vault # 2 for long-term management of leachate. During closure the leachate flow was observed to rapidly fill the 1,200-gallon tank. For this reason a 15,000-gallon Baker tank is located adjacent to Vault #2 to accommodate the large volume of leachate generated during the closure period. Management of leachate during the closure period is described in Section 4.0.

The leachate pumping system consists of pumps and controls manufactured by EPG Companies. The following equipment was used:

- WSDPT 8-5 wheeled sump drainer with level transmitter, 1.5 HP 230 V motor (each sump),
- EPG Series L925PT Controller.

Appendix E presents the EPG pump and controller operation manual. Figure 7 presents a system schematic of the sumps, riser pipes, and Vaults #1 and 2. Figure 8 presents a schematic of the LCRS/LDCRS piping in Vault #1. The following table summarizes the equipment installed in Vaults #1 and 2:

Vault #1	Vault # 2
Utility Vault Company 810 LA EPG Series L925PT Controller Air exchange fan Lighting Sump pump Transformer Phone Dialers (2)	Utility Vault Company 712 LA Tank level sensors Leak detection float Norwesco 1,200 gallon Cistern 41329 Air exchange fan Lighting Sump pump

Two 4-inch ventilation pipes were installed on each vault. A blower is attached to one of the ventilation pipes in each vault. When the vault man-way is open a switch is activated to turn on the blower and lighting. An access ladder with an extendable hand rail was installed in each vault. Locking water-tight access lids were installed on the top cover of each vault.

Piping and utilities were installed in a trench excavated between the two vaults. The trench included the following piping:

- 6-inch diameter HDPE pipe sleeve over a 2 inch diameter HDPE leachate pipe
- (2) 2-inch PVC conduits for power
- (2) 1-inch PVC conduits dialer phone lines
- 3-inch PVC irrigation pipe

All electrical wiring for power and phone services was installed by Custom Electric.

3.4.1 Leachate Storage Controls

Monitoring of leachate volumes and operation of the LCRS and LDCRS is provided using a system of phone dialers in Vault #1. The system includes two phone dialers and six alarm settings. The phone dialers will be set to contact maintenance personnel in the event of a pump malfunction, flooding in the vaults, or when the leachate storage tank requires pumping.

The first dialer monitors the operation of the pumps in the LCRS and LDCRS and sends an alarm when the pumps fail to operate. The pumps are designed to turn on in response to level sensors located in the LCRS and LDCRS sumps. Dialer 1 also monitors the leachate level in the storage tank located in Vault #2. When the tank level reaches 75 percent full an alarm is sent. In the event that the 75 percent full alarm does not receive a response, a second alarm is sent when the tank level reaches 90 percent full.

Dialer 2 monitors for flood conditions in Vaults #1 and 2 and an alarm is sent if the vault floor sump pumps malfunction and flooding occurs in the bottom of the vault. Appendix E presents the wiring schematic prepared by Custom Electric.

3.5 S.A. Backfill

Placement of SA Backfill began during the summer of 2003 as part of the construction of the south ramp. The original project specification allowed for two gradations of SA backfill. The first gradation consists of material passing the ¾ inch screen (cushion material). The second gradation required 100 percent of the material to be smaller than six inches. During construction the specification was revised to allow placement of demolition debris up to 24-inch size. Figure 9 presents the as-built contour of the final SA backfill including the liner subgrade layer.

The south ramp fill consists of SA material and demolition debris (crushed concrete from foundations). Fine material was typically placed in the initial ramp fill adjacent to the cushion layer. The ramp was reinforced against sliding using a high strength geogrid anchored at the top of the OCF crest (see photos in Appendix A). A granular traffic surface was placed on the ramp surface.

Backfill within the interior of the OCF cell included coarser demolition debris blended with other SA soils. These materials were typically placed in horizontal 12-inch lifts and compacted using a vibratory smooth drum roller (Vibromax 1105 or equivalent) to a minimum of 90 percent of standard proctor density. When the fill contained more than 30 percent coarse material (larger than ¾ inch) a method specification was allowed that consisted of a minimum three passes with the vibratory roller. In some cases concrete foundations and slabs (up to 24 inch thick) were placed on the fill within the interior of the cell. Backfill was placed in lifts adjacent to the concrete pieces in order to provide adequate compaction.

The upper portion of the SA backfill consisted of material that was imported on barges from Asarco's Everett Smelter site. Approximately 25,000 cubic yards were imported from the Everett site. This material was placed in the upper 5 feet of the backfill.

Monitoring of SA backfill was conducted by ACI personnel and compaction testing was completed by HWA. Table 9-1 (Appendix B) presents monitoring data for SA backfill placement.

3.6 Cover

Modifications to the OCF embankment geometry and changes in the ultimate SA backfill volume resulted in changes in the OCF cover design. Modifications to the design geometry were required to accommodate the ultimate SA backfill volume. GCL was substituted for the cover CSL to reduce the period required for construction and to allow construction to be completed during a single construction season. Modifications were also made to the cover drainage system including:

- Drain system manholes were offset nine feet from the bottom liner system for constructability and to prevent undermining the bottom liner during excavation.
- The cover anchor trench detail was revised from a V ditch to a rectangular trench.

- Pipe boots were added to the anchor trench where drain pipes connected to each manhole.

Construction of the cover system began during August 2005 with final grading of the SA backfill. The upper end of the access ramp at the southwest corner of the cell was excavated at that time. A cover subgrade layer consisting of 12 inches of soil passing the ¾ inch screen was placed over the SA backfill. A temporary ramp was placed on the north side of the OCF consisting of the screened subgrade material. The cover anchor trench was excavated five feet outside the bottom liner system on the OCF dike and three feet offset along the west perimeter (see Figures 10 and 13).

The typical cover liner section is presented on Figure 13 and consists of:

- a GCL,
- 40-mil DST HDPE membrane,
- 16-ounce per yard cushion geotextile,
- 12 inches of biotic drain rock
- 6-ounce per yard separation geotextile, and
- 2 feet of cover soil.

The GCL and geomembrane were deployed across the OCF surface and progressed from south to north. Both layers were deployed as the work progressed to the north in order to utilize access from the uncovered subgrade surface. Access around the perimeter of the OCF was not possible due to the limited crest area and excavation for the anchor trench. Rolls of cushion geotextile were staged across the cover surface for deployment once seaming and cleanup activities were completed. The cushion geotextile was placed across the entire width of the OCF surface and anchor trench. Two feet of overlap were provided outside of the anchor trench.

Placement of drain pipes, installation of pipe boots and cleanout were completed around the perimeter anchor trench prior to placing the biotic drain layer. Details for the perimeter drain system are presented on Figures 14 and 15.

The biotic drain rock was imported from Glacier Northwest's DuPont, Washington, pit on barges and off loaded onto haul trucks using a barge mounted conveyor system. The biotic rock was spread across the cover surface and placed in the perimeter anchor trench/drain section. The overlap from the 16-ounce cushion geotextile was then folded over the biotic drain rock around the perimeter. The final surface was then covered with a 6-ounce per square yard non-woven separation geotextile. This layer was tack welded to the cushion geotextile to encapsulate the biotic drain rock (see Figure 13).

Two feet of cover soil was placed over the separation geotextile. The first 18 inches consisted of common borrow: a sand and gravel mixture passing the 1.5 inch screen size. The top six inches consisted of Type C topsoil as defined under WSDOT standard specifications.

The Bennett Street parking area will be constructed over the OCF across the southwest portion of the cell. Common borrow cover soil was placed to a depth of 24 inches within this area (see Figure 12).

4.0 Closure and Post-Closure

Leachate production will occur over a period of several years beyond construction of the cover system. During December 2005 approximately 400 gallons per day were being pumped from the LCRS sump. Due to the volume of leachate occurring during this closure period, leachate is being pumped to a 15,000-gallon Baker tank located directly south of Vault #2. The leachate generation rate occurring during the closure period does not allow use of the 1,200-gallon tank provided in Vault #2, therefore a bypass pipe from Vault #2 is used to divert leachate to the Baker tank. Once leachate levels decline to manageable levels, the Baker tank will be removed and leachate will be stored in the Vault #2 tank. Modifications to the piping in Vault #2 and programming of the leachate tank dialers will be required at this time.

An Operation, Maintenance, and Monitoring Plan (OMMP, Hydrometrics, July 2001) addresses operation and maintenance for the OCF to satisfy 40 CFR Sections 264.115-120 and 264.310. An action leakage rate of 2 gallons per day has been defined for the OCF LDCRS. A response action plan is defined in the OMMP and describes monitoring frequency, reporting, and maintenance requirements during the closure and post-closure periods.

5.0 References

United States Environmental Protection Agency, 1995a. Record of Decision Commencement Bay Nearshore Tideflats Superfund Site Operable Unit 02. Asarco Tacoma Smelter Facility Ruston and Tacoma, Washington, March 1995.

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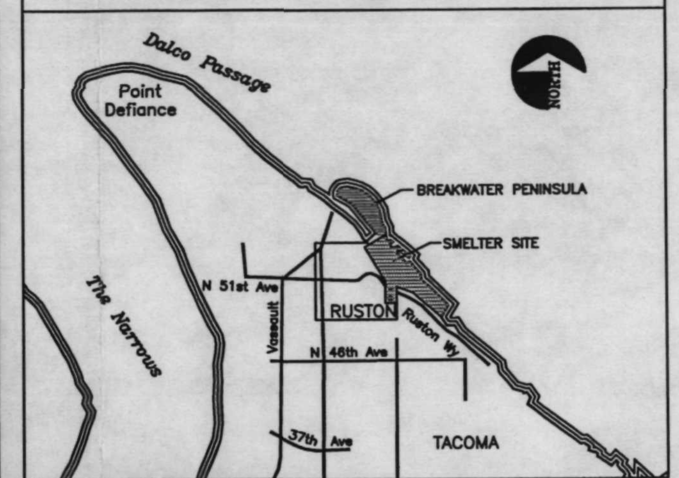
ASARCO LLC - TACOMA

ON - SITE CONTAINMENT FACILITY
AS -BUILT REPORT

GENERAL LOCATION MAP



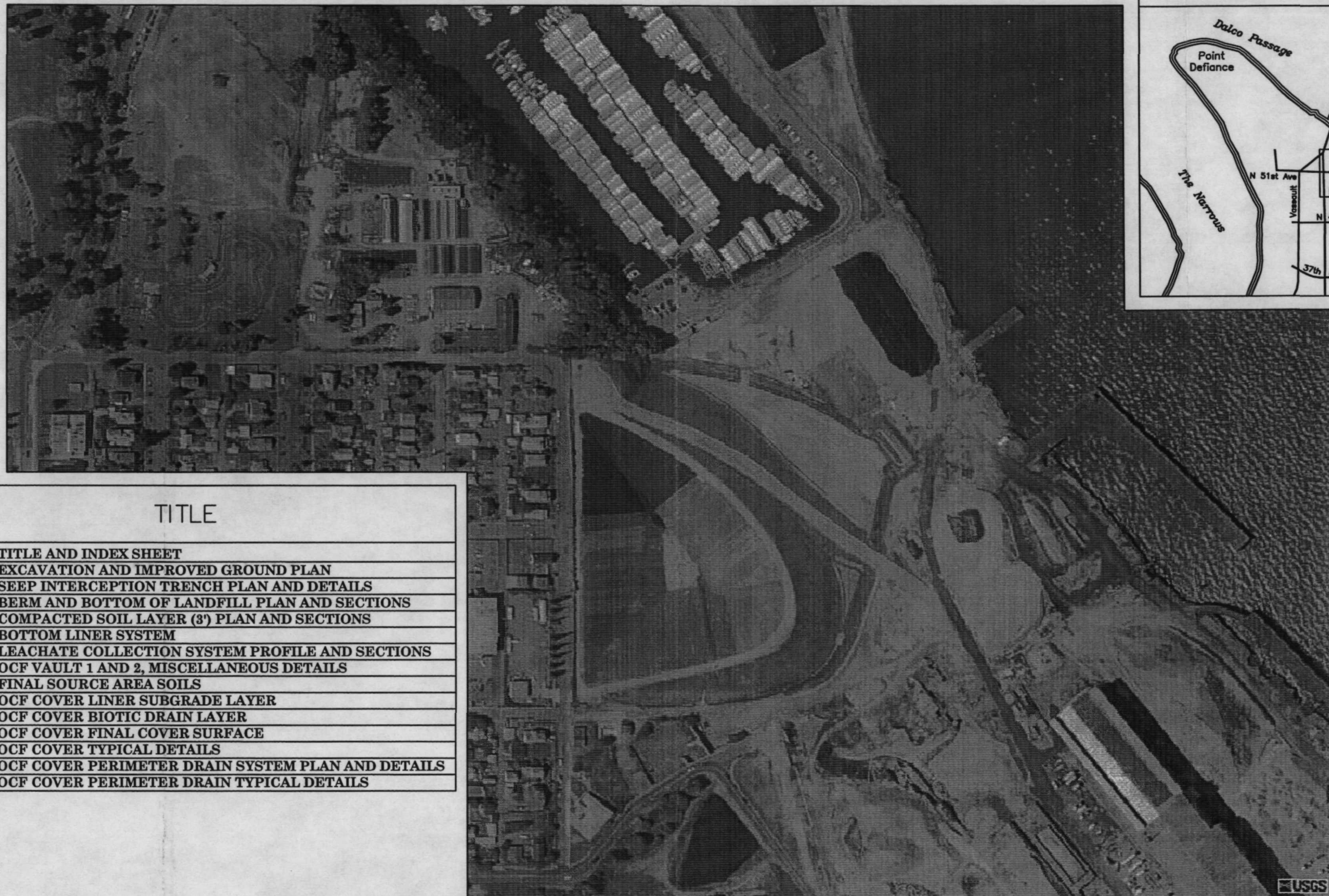
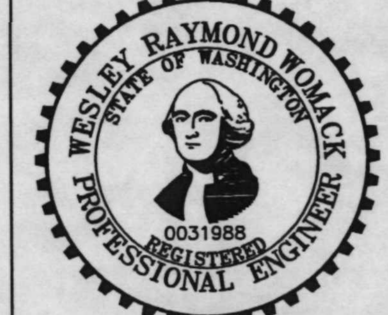


FIGURE NO.	TITLE
1	TITLE AND INDEX SHEET
2	EXCAVATION AND IMPROVED GROUND PLAN
3	SEEP INTERCEPTION TRENCH PLAN AND DETAILS
4	BERM AND BOTTOM OF LANDFILL PLAN AND SECTIONS
5	COMPACTED SOIL LAYER (3') PLAN AND SECTIONS
6	BOTTOM LINER SYSTEM
7	LEACHATE COLLECTION SYSTEM PROFILE AND SECTIONS
8	OCF VAULT 1 AND 2, MISCELLANEOUS DETAILS
9	FINAL SOURCE AREA SOILS
10	OCF COVER LINER SUBGRADE LAYER
11	OCF COVER BIOTIC DRAIN LAYER
12	OCF COVER FINAL COVER SURFACE
13	OCF COVER TYPICAL DETAILS
14	OCF COVER PERIMETER DRAIN SYSTEM PLAN AND DETAILS
15	OCF COVER PERIMETER DRAIN TYPICAL DETAILS



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OCF AS–BUILT REPORT
TITLE AND
INDEX SHEET

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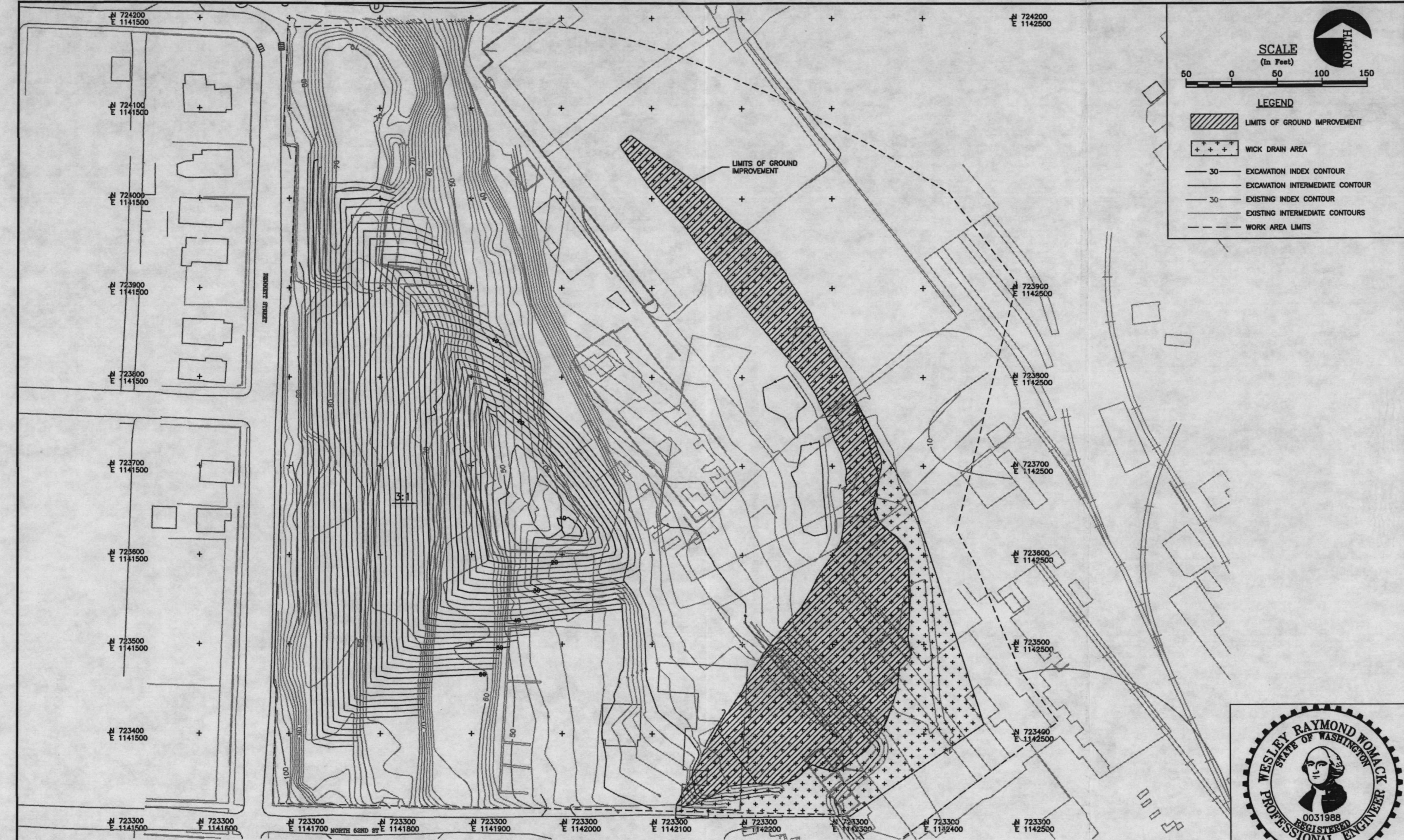
AUTOCAD
FIGURE NUMBER: 1
REV: △



WESLEY RAYMOND WOMACK
STATE OF WASHINGTON
0031988
REGISTERED
PROFESSIONAL ENGINEER

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EXCAVATION SITE PLAN

SCALE: 1" = 100'

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EXCAVATION AND IMPROVED GROUND PLAN

DRAWING FILE NUMBER
AB_OCF_02.dwg
AUTOCAD
FIGURE NUMBER 2
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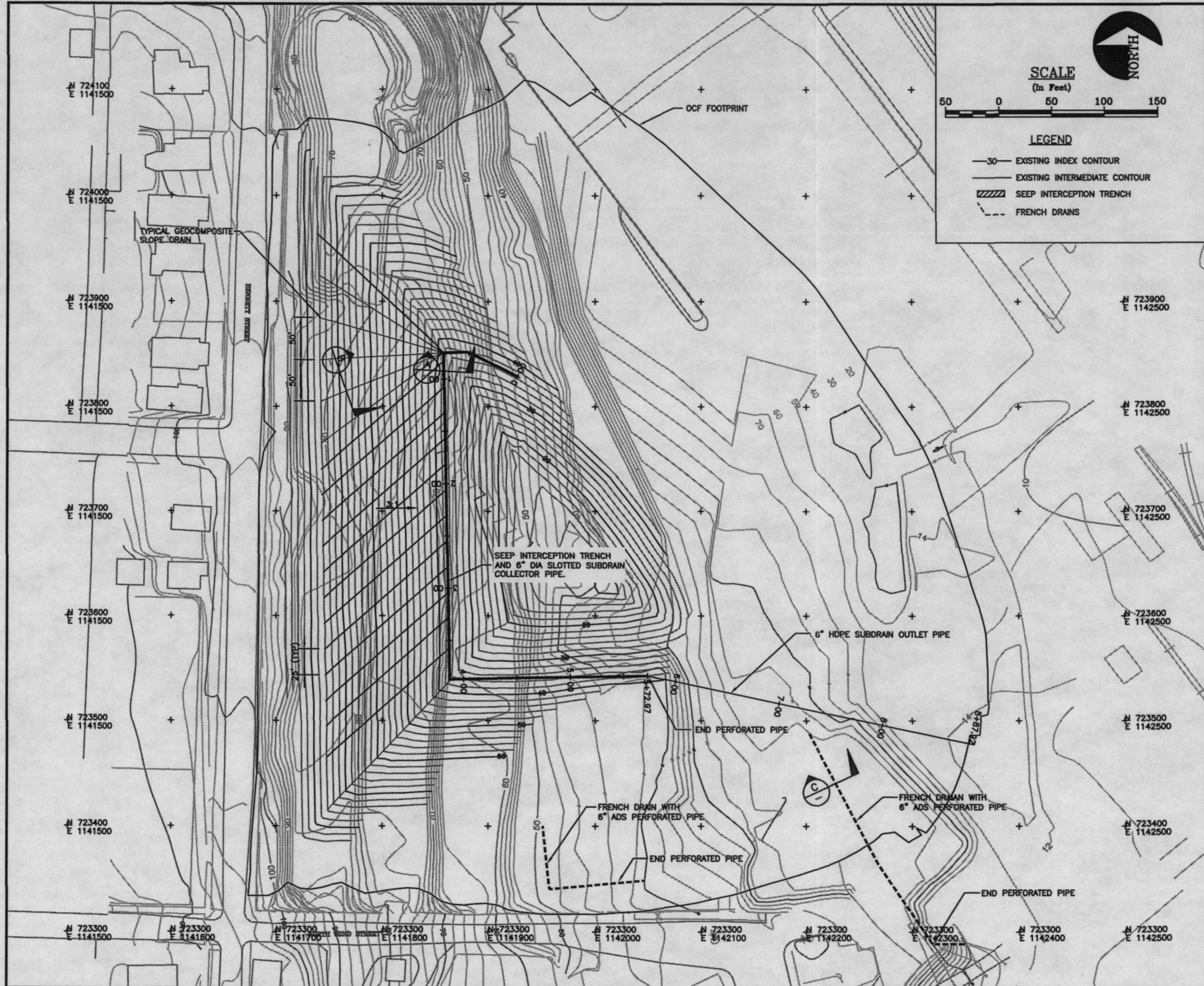
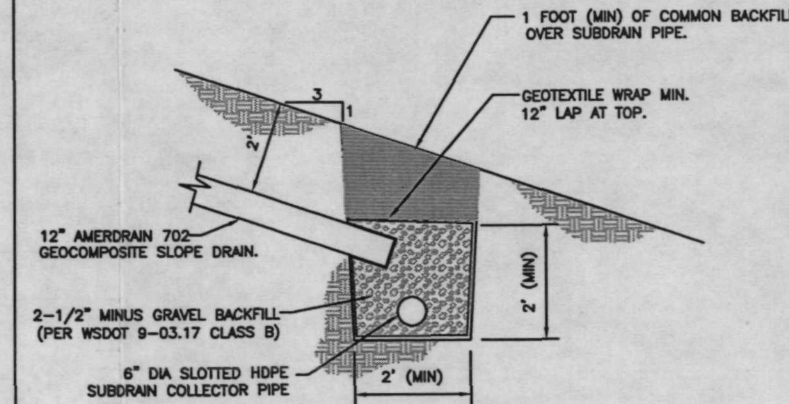


SITE PLAN

SCALE: 1" = 100'



SECTION A SEEP INTERCEPTION TRENCH
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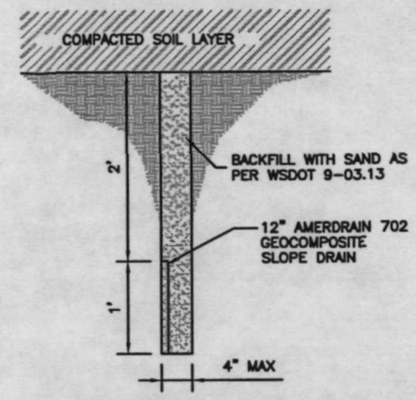

SECTION B GEOCOMPOSITE SLOPE DRAIN
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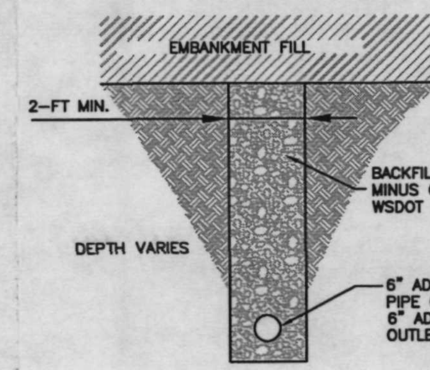
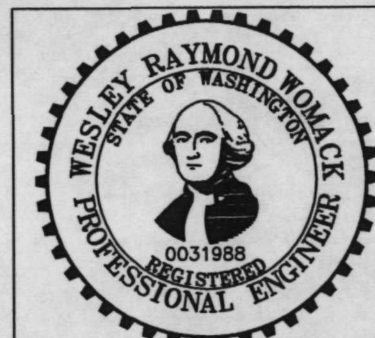


SECTION C FRENCH DRAINS
SCALE: NTS



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OCF AS-BUILT REPORT
SEEP INTERCEPTION TRENCH
PLAN AND DETAILS

DRAWING FILE NUMBER: AB_OCF_03.dwg
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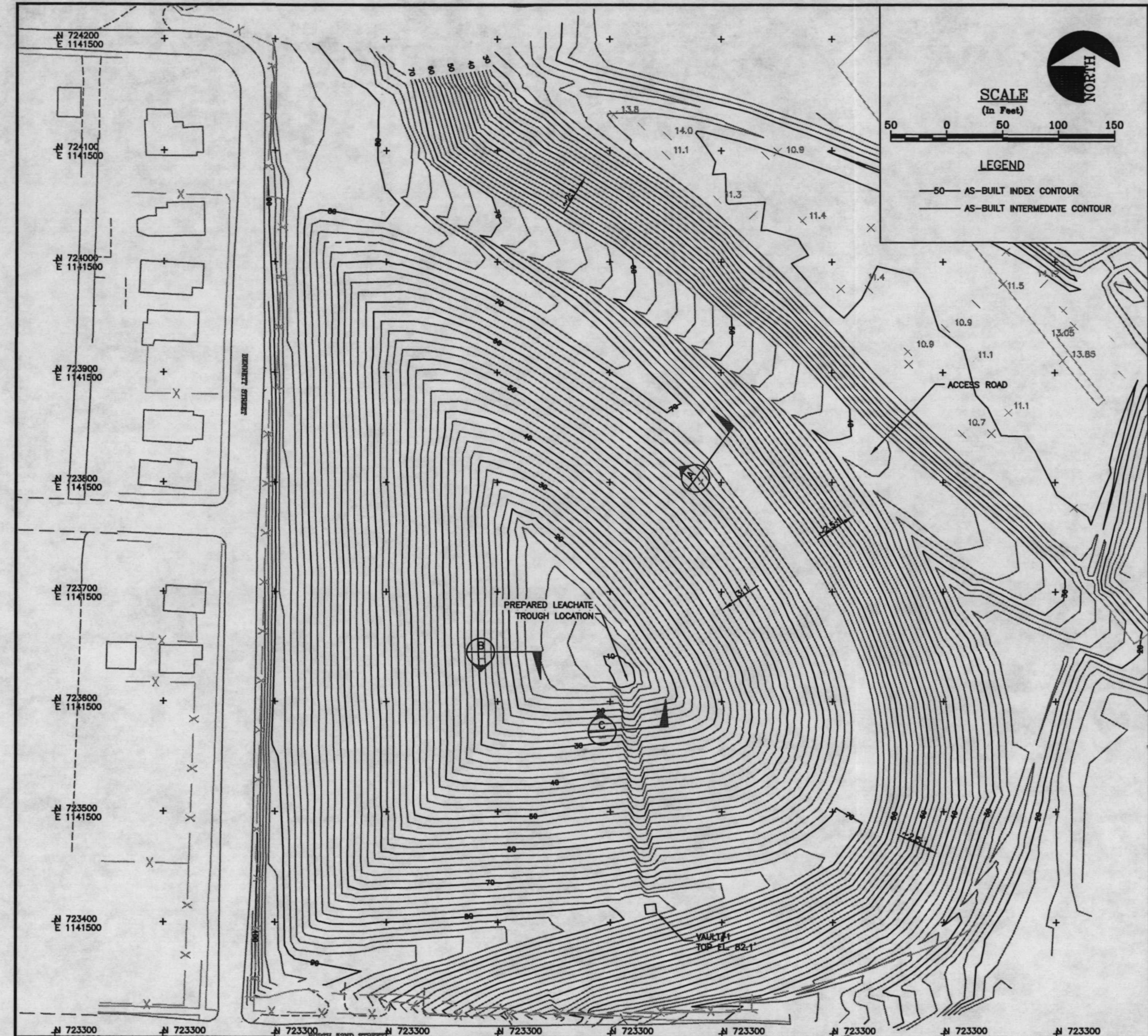
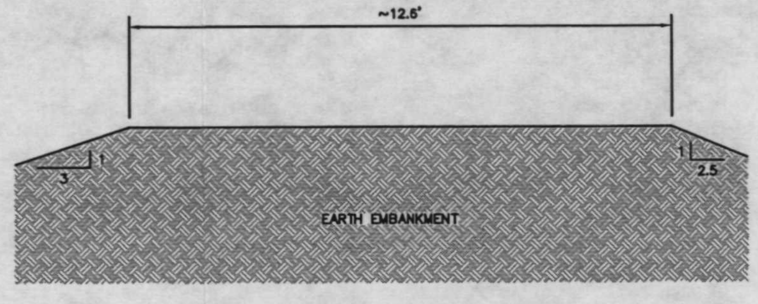
FIGURE NUMBER: 3
REV

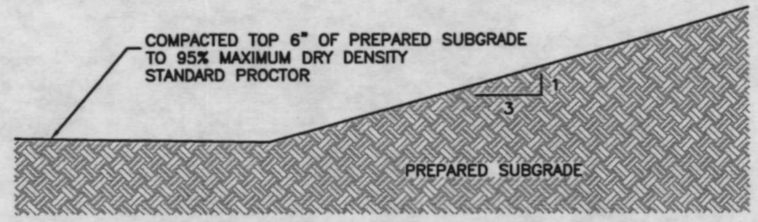


SITE PLAN

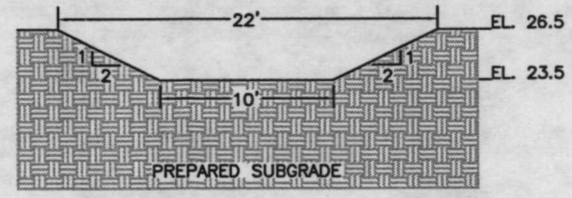
SCALE: 1" = 100'



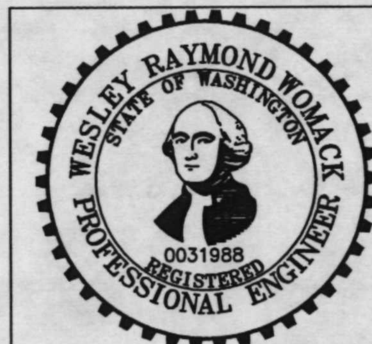
SECTION A EMBANKMENT CREST
SCALE: 1"=2'



SECTION B LANDFILL LINER
SCALE: NTS



SECTION C LEACHATE TROUGH (TYP)
SCALE: NTS



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1			
2			
3			

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OCF AS-BUILT REPORT
BERM AND BOTTOM OF LANDFILL
PLAN AND SECTIONS

DRAWING FILE NUMBER: AB_OCF_04.dwg
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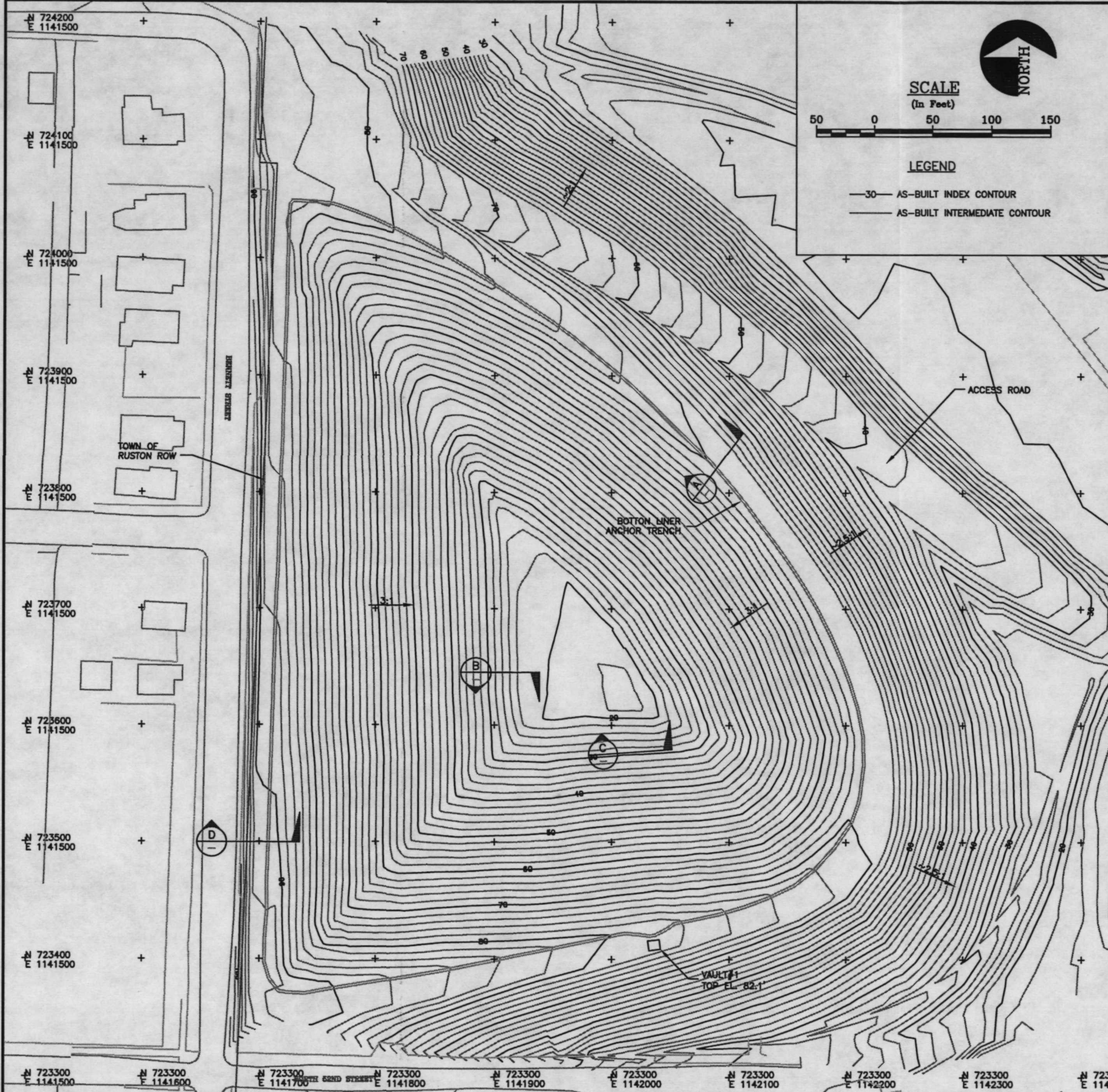
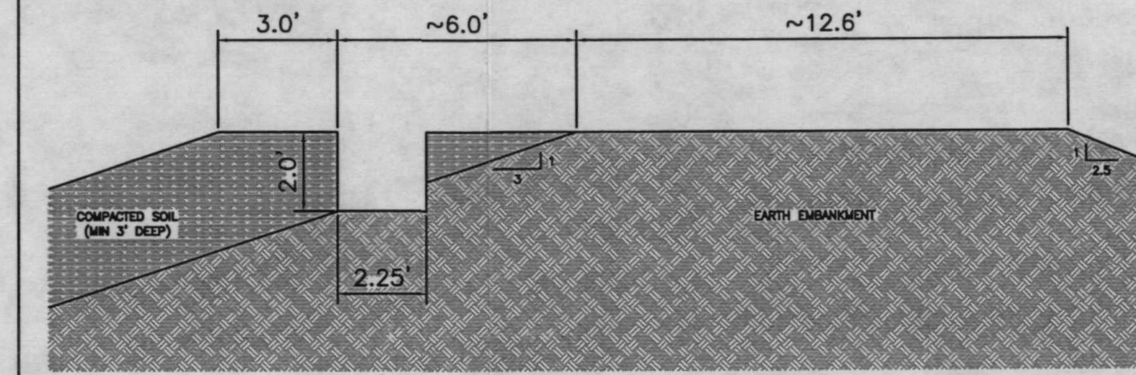
REV



SITE PLAN

SCALE: 1" = 100'



SECTION A — ANCHOR TRENCH
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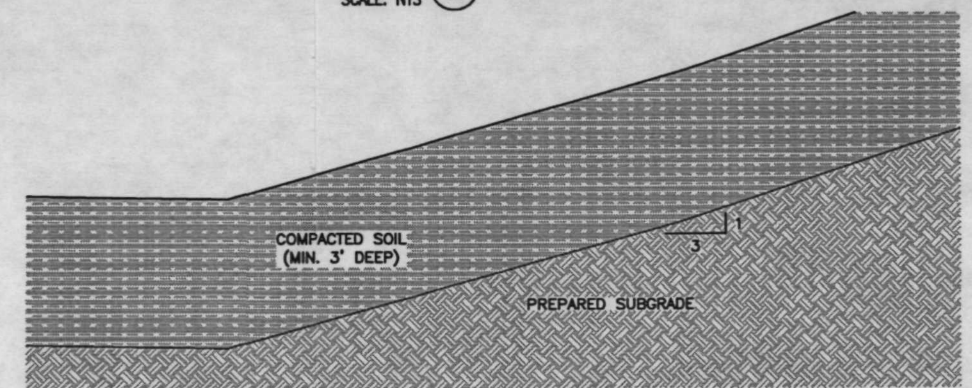
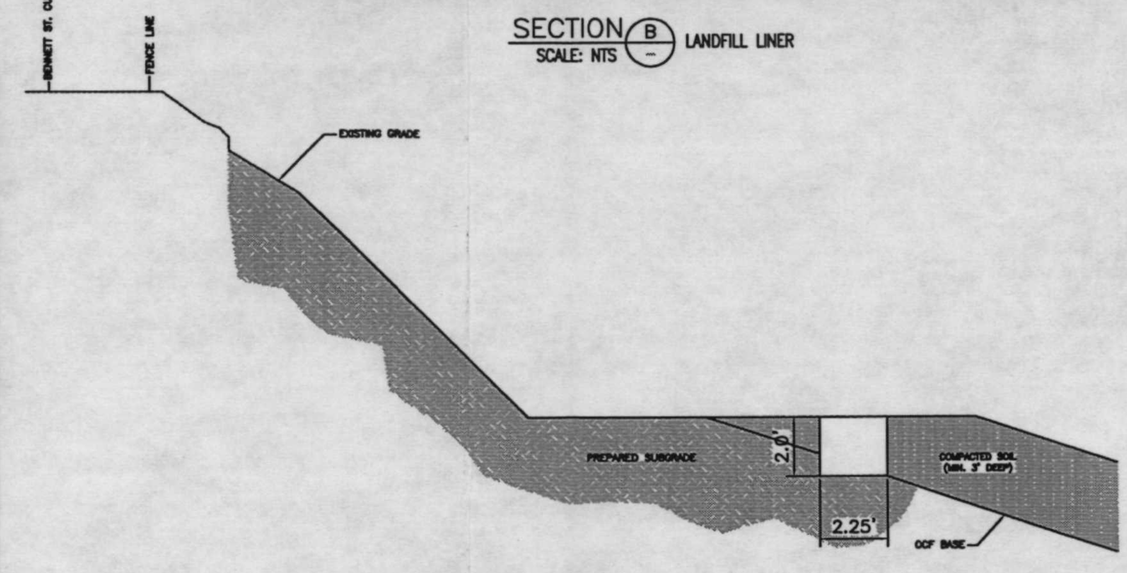
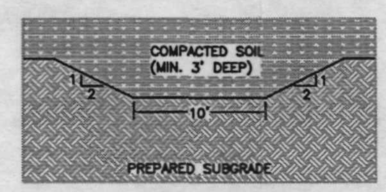


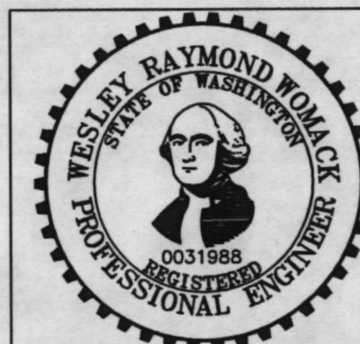
SECTION B — LANDFILL LINER
SCALE: NTS



SECTION D — BENNETT ANCHOR TRENCH
SCALE: NTS



SECTION C — LEACHATE TROUGH (TYP)
SCALE: NTS



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ASARCO LLC – TACOMA
OCF AS-BUILT REPORT
COMPACTED SOIL LAYER (3')
PLAN AND SECTIONS

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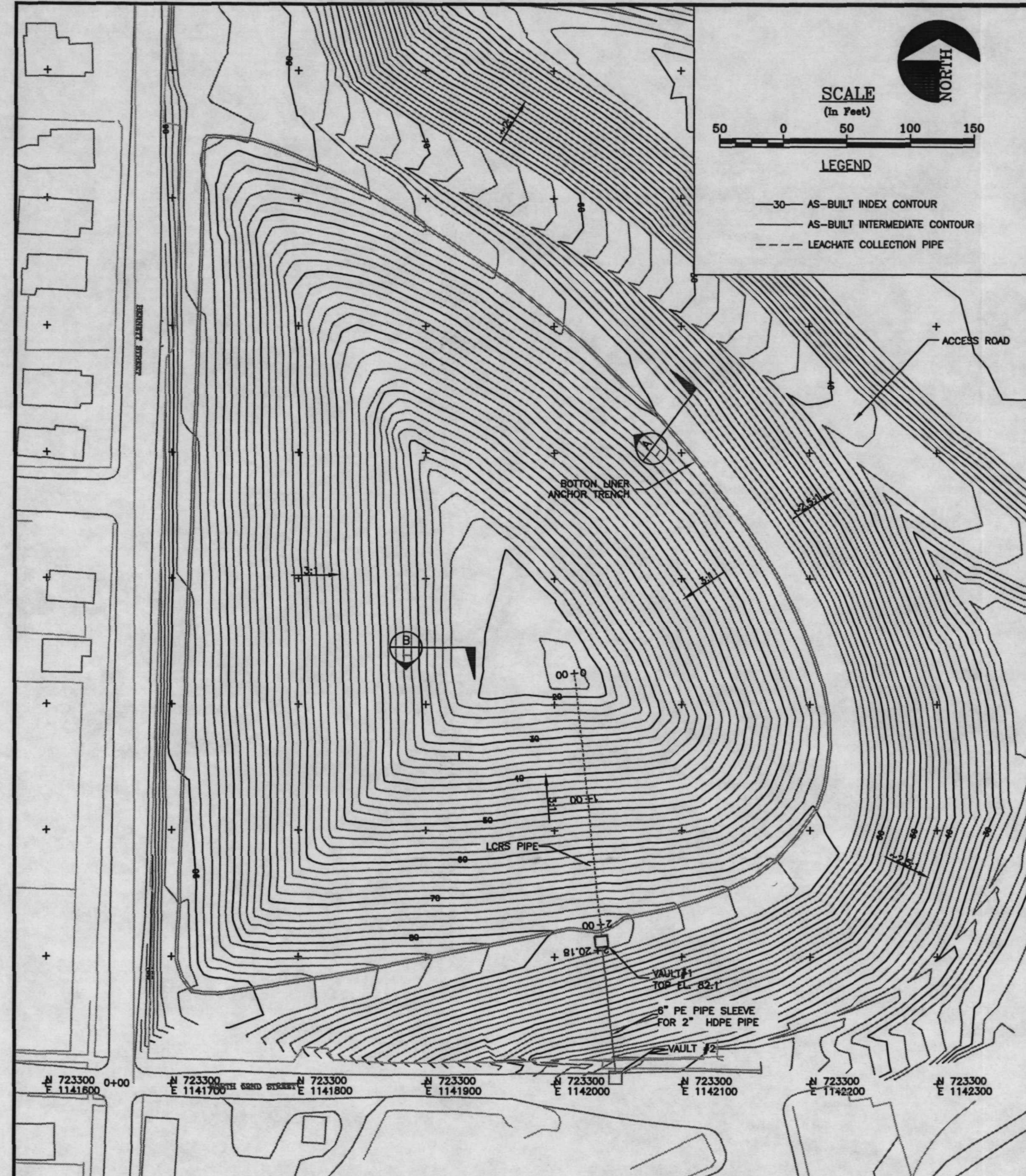
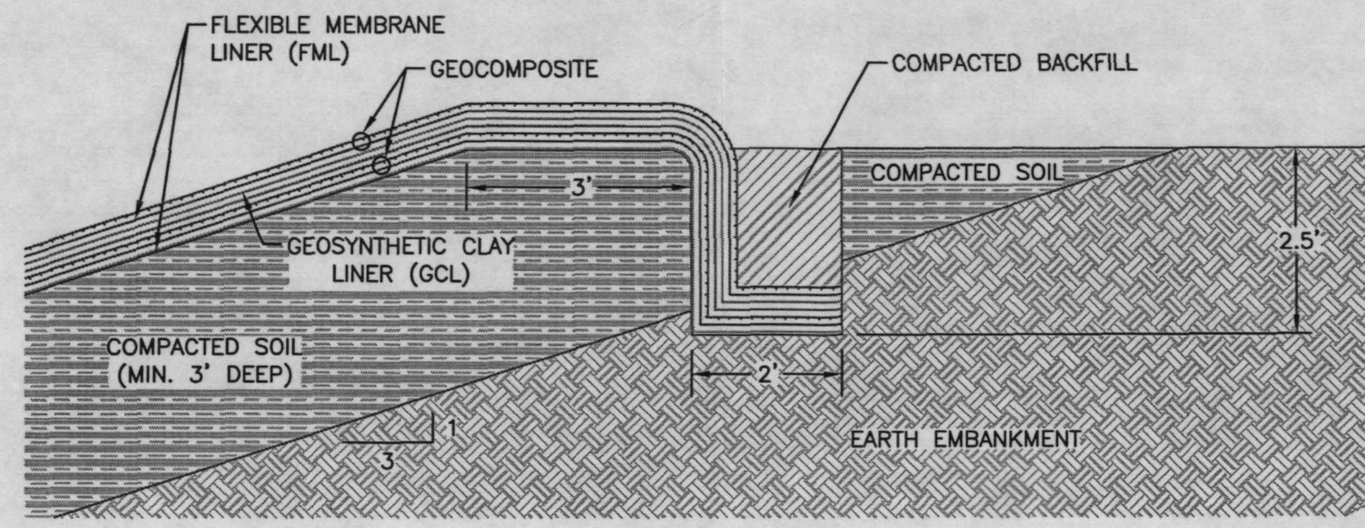
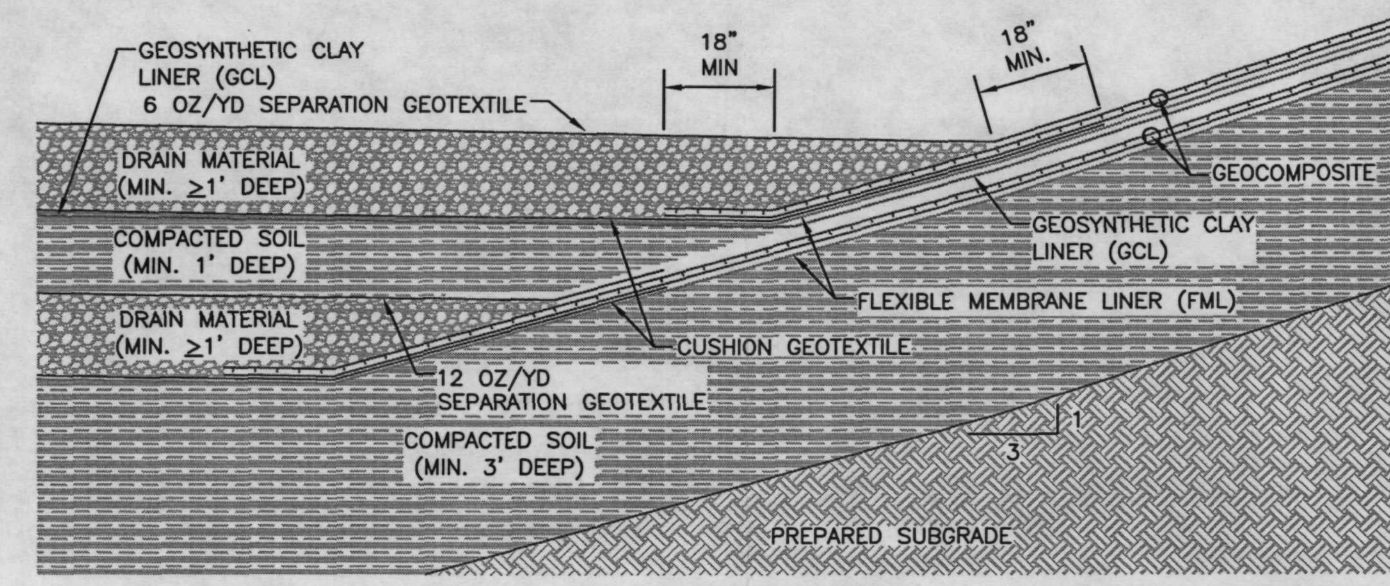


SITE PLAN

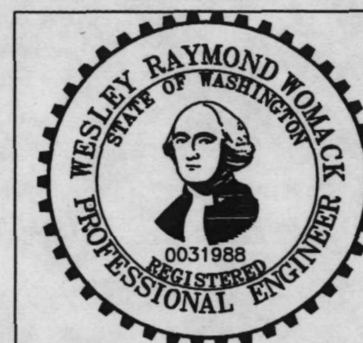
SCALE: 1" = 100'



SECTION A
SCALE: NTS
ANCHOR TRENCH



SECTION B
SCALE: NTS
LANDFILL LINER



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OCF AS-BUILT REPORT
BOTTOM LINER SYSTEM

DRAWING FILE NUMBER
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AUTOCAD
FIGURE NUMBER 6
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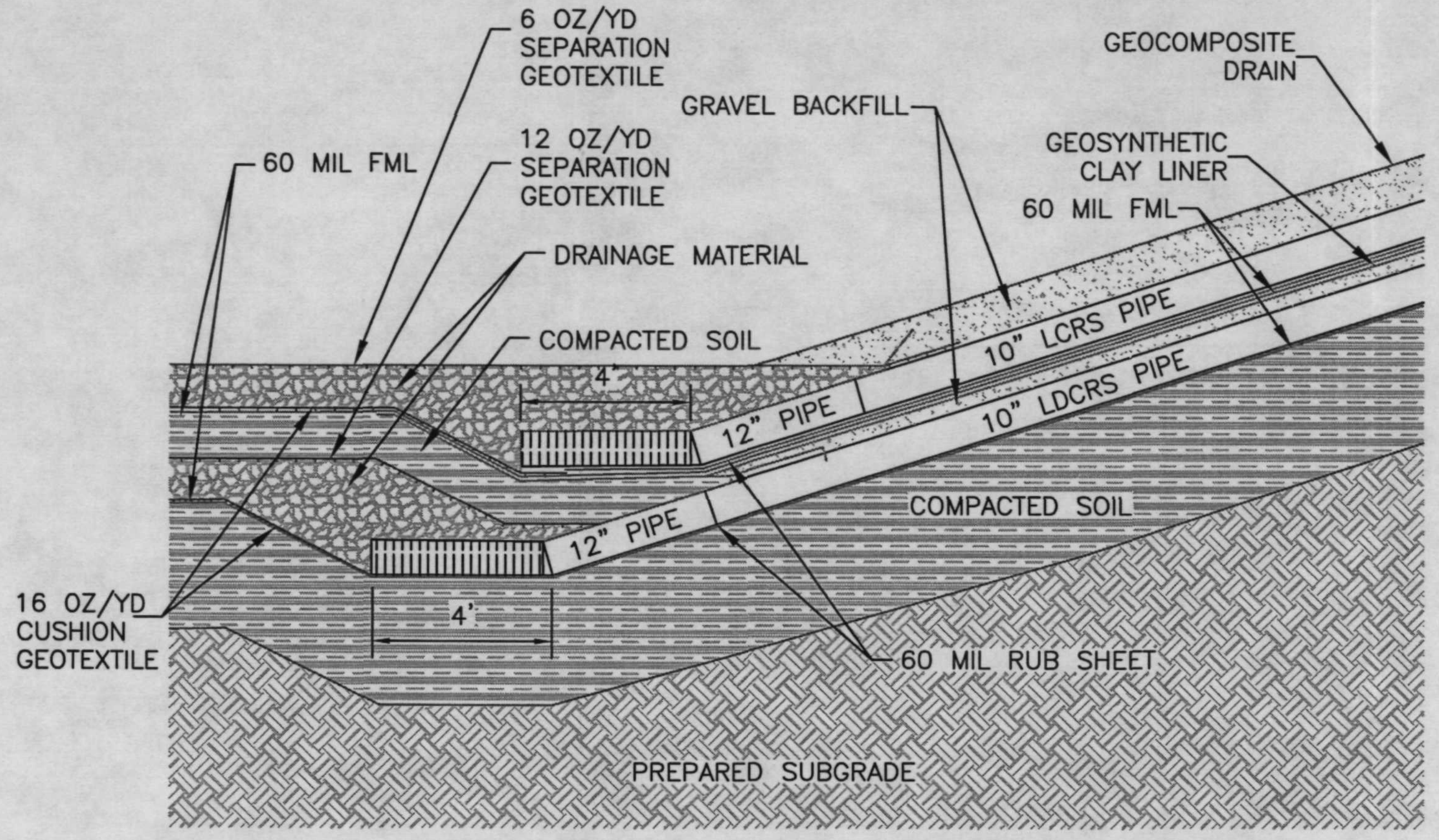
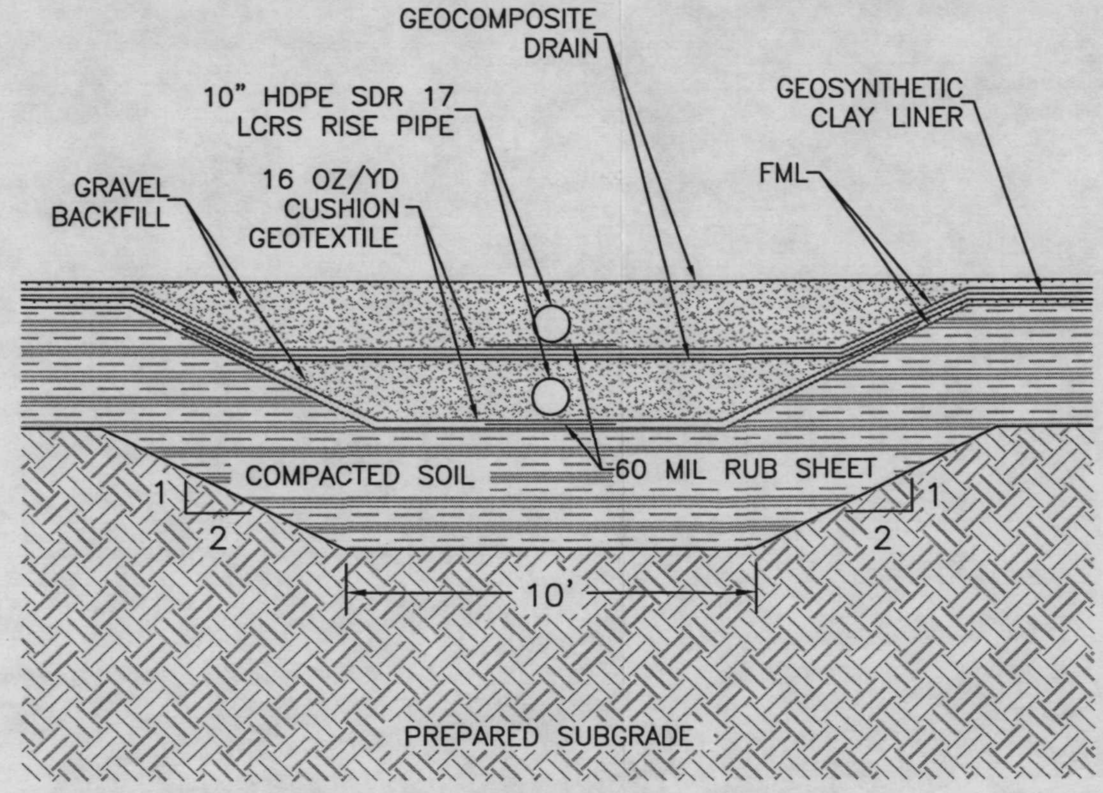
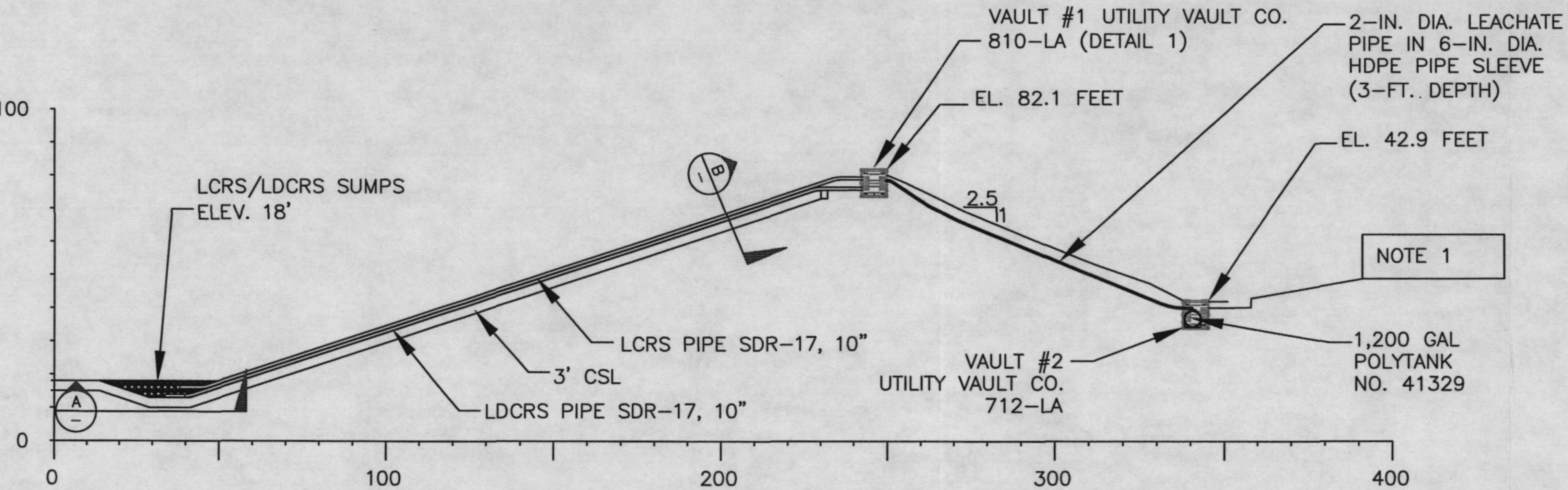


SECTION A LEACHATE SUMPS
SCALE: NTS

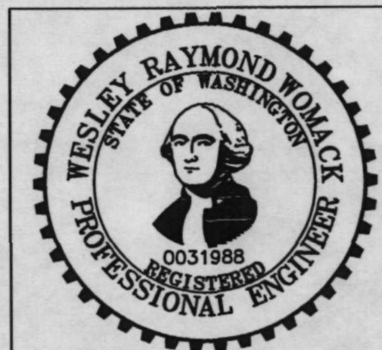


SECTION B LEACHATE TROUGH (TYP.)
SCALE: NTS



NOTE 1: BYPASS PIPELINE TO TEMPORARY 15,000 GAL. BAKER TANK.

SECTION C SYSTEM SCHEMATIC
SCALE: 1"= 40'



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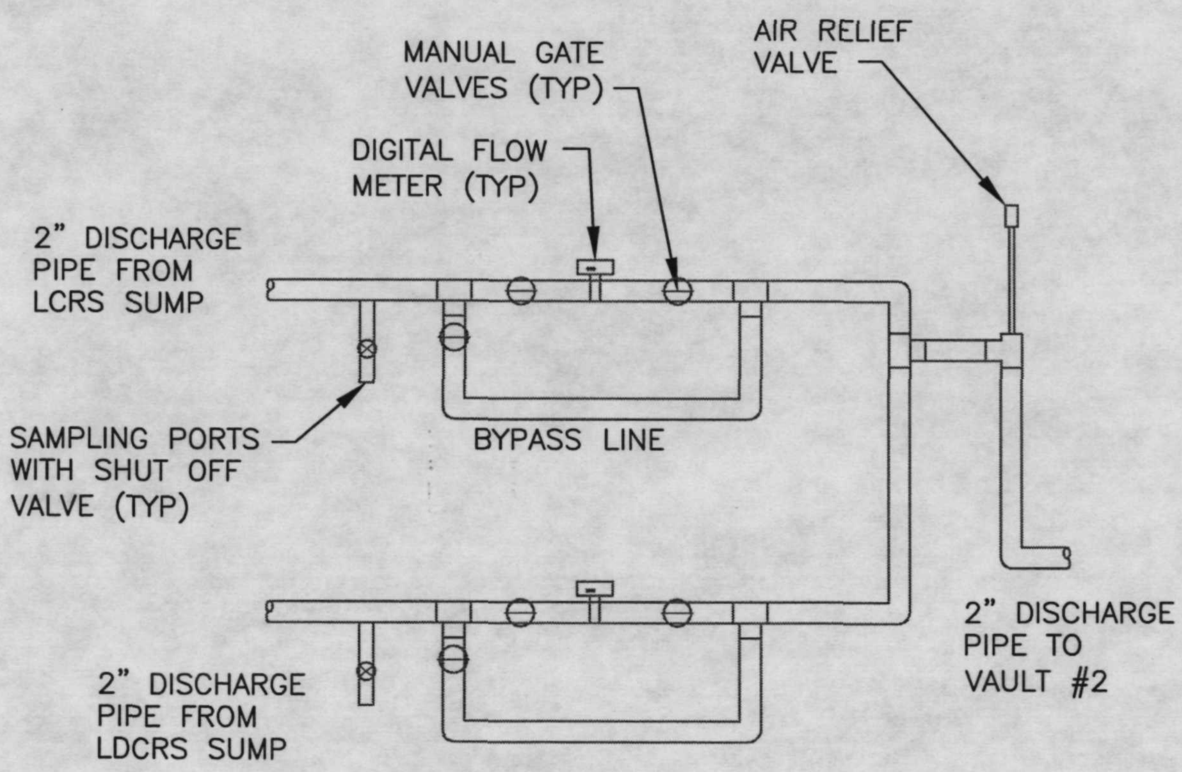
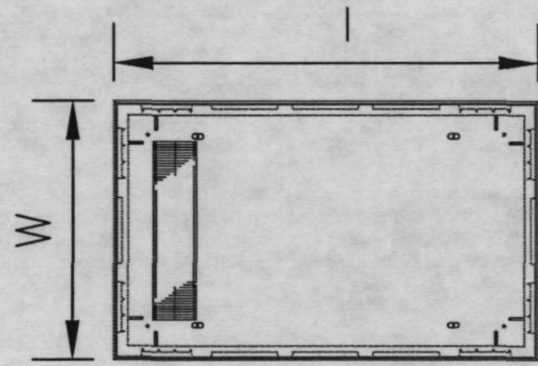
ASARCO LLC – TACOMA
OCF AS-BUILT REPORT
LEACHATE COLLECTION SYSTEM
PROFILE AND SECTIONS

DRAWING FILE NUMBER: AB_OCF_07.dwg
AUTOCAD
FIGURE NUMBER: 7
REV



SYSTEM SCHEMATIC

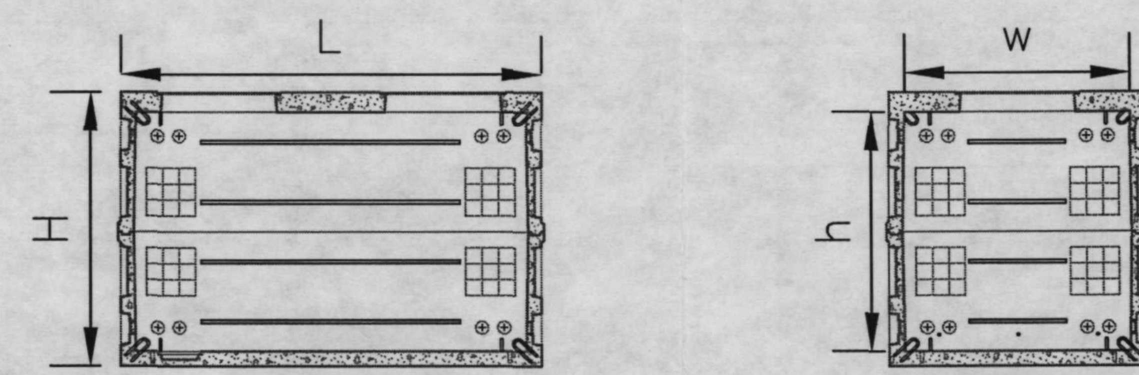
SCALE: NONE
PIPING VAULT #1



TOP VIEW

DIMENSIONS VAULT 1 & 2

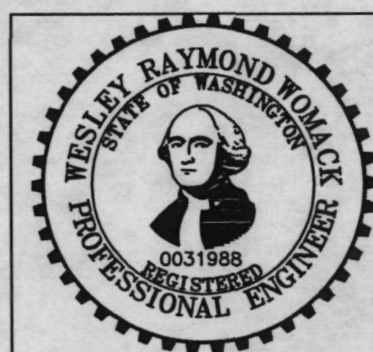
MODEL	712-LA	810-LA
L	13'1"	10'8"
l	12'3"	9'11"
H	8'7"	8'2"
h	7'6"	7'0"
W	8'0"	8'8"
w	7'1.5"	7'11"



SIDE VIEW **END VIEW**

VAULTS 1 & 2

SCALE: NONE
(TYPICAL)



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OCF AS-BUILT REPORT
OCF VAULT 1 AND 2
MISCELLANEOUS DETAILS

DRAWING FILE NUMBER
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FIGURE NUMBER 8
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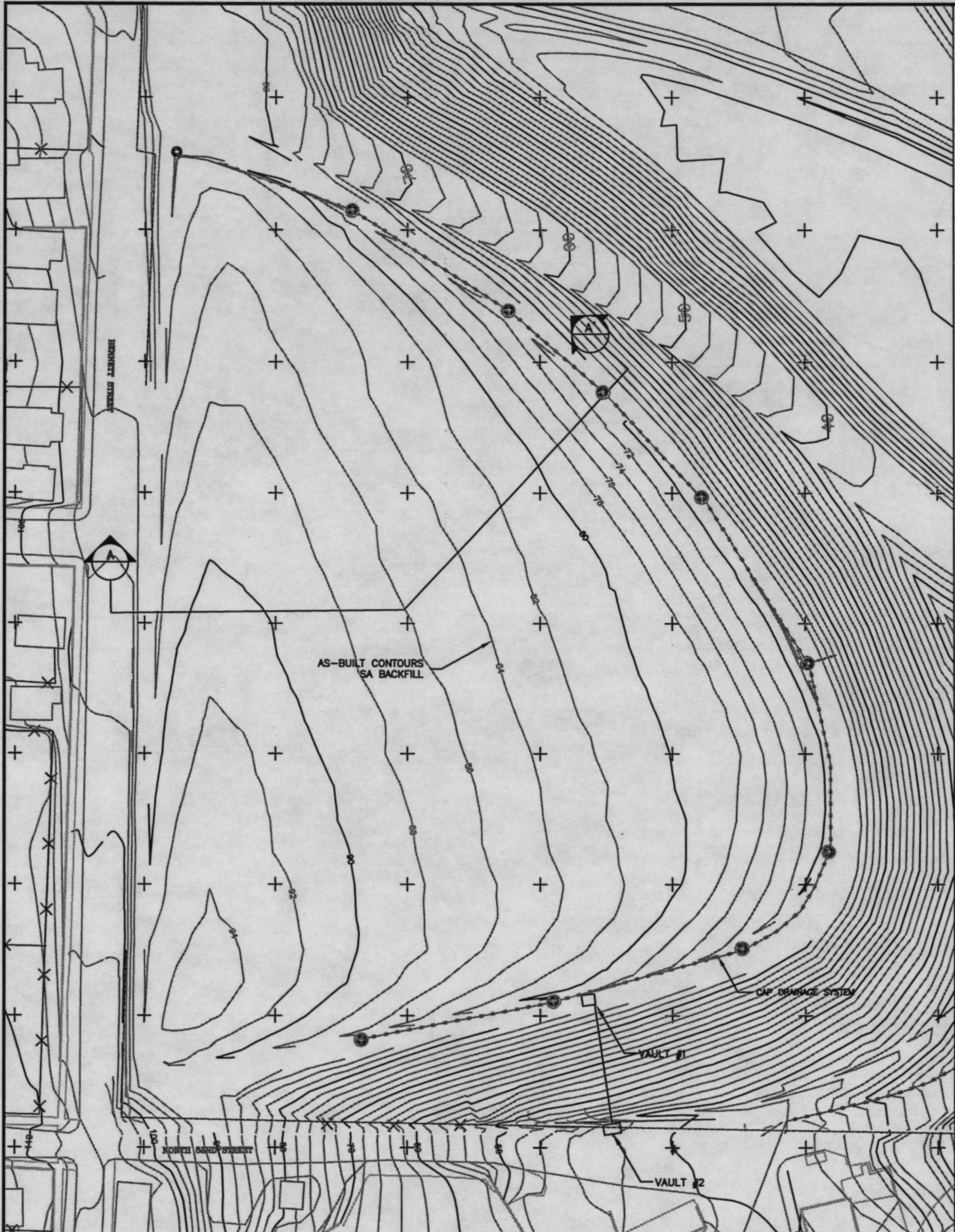
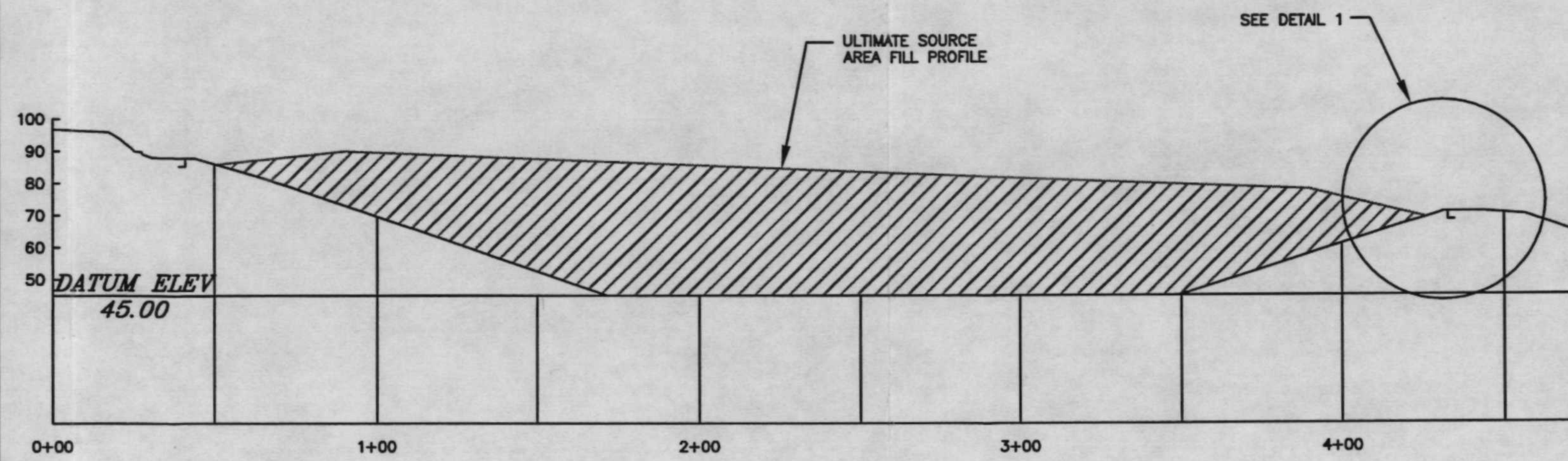


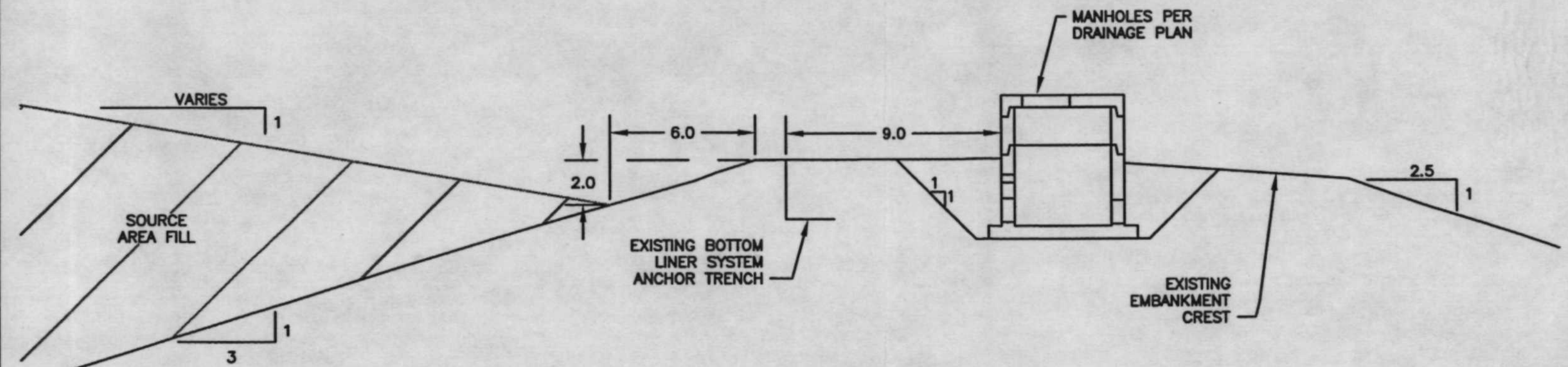
SITE PLAN

SCALE: 1" = 100'



SECTION A-A' - SOURCE AREA FILL SECTION

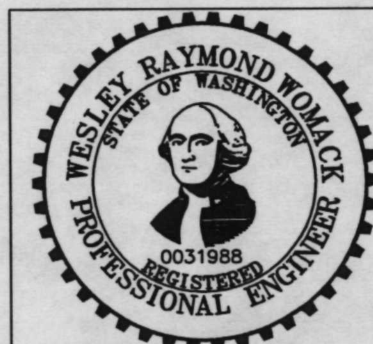
SCALE IN FEET 0 15 30 60



DETAIL 1 - SOURCE AREA FILL TOE DETAIL

SCALE IN FEET 0 2 4 8

NOTES:
1. SOURCE AREA FILL CONTOURS ARE BASED ON 2005 AS-BUILT SURVEY.
2. TOP 12 INCHES OF SOURCE AREA BACKFILL PROCESS TO REMOVE +3/4-INCH MATERIAL.



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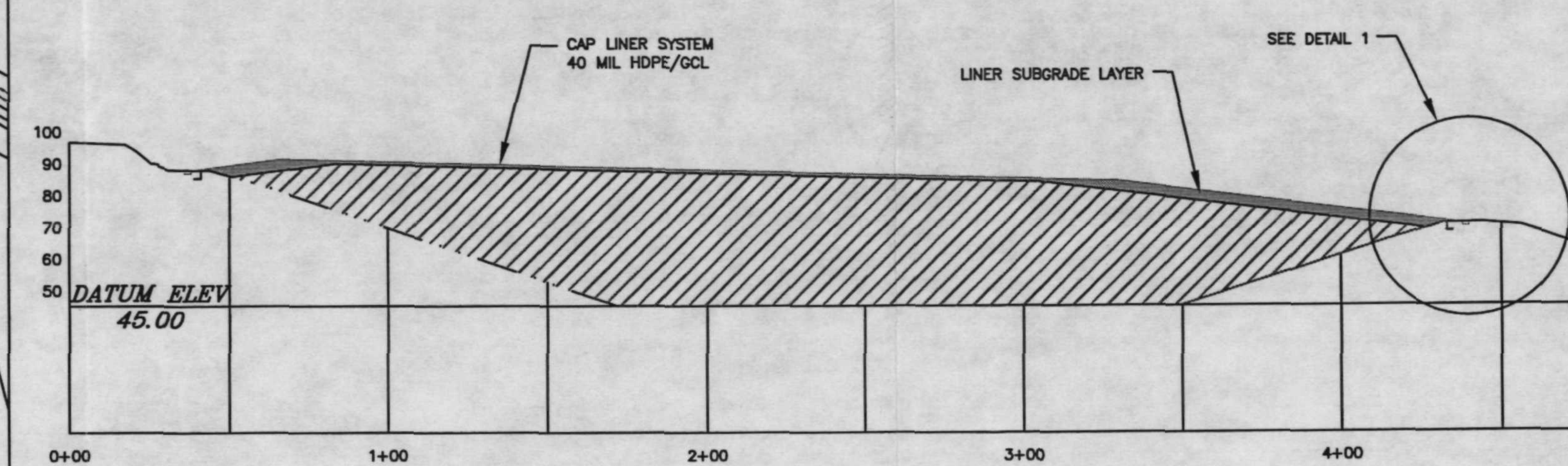
ASARCO LLC - TACOMA
OCF AS-BUILT REPORT
FINAL SOURCE AREA SOILS

DRAWING FILE NUMBER: AB_OCF_09.dwg
AUTOCAD
FIGURE NUMBER: 9
REV

SITE PLAN

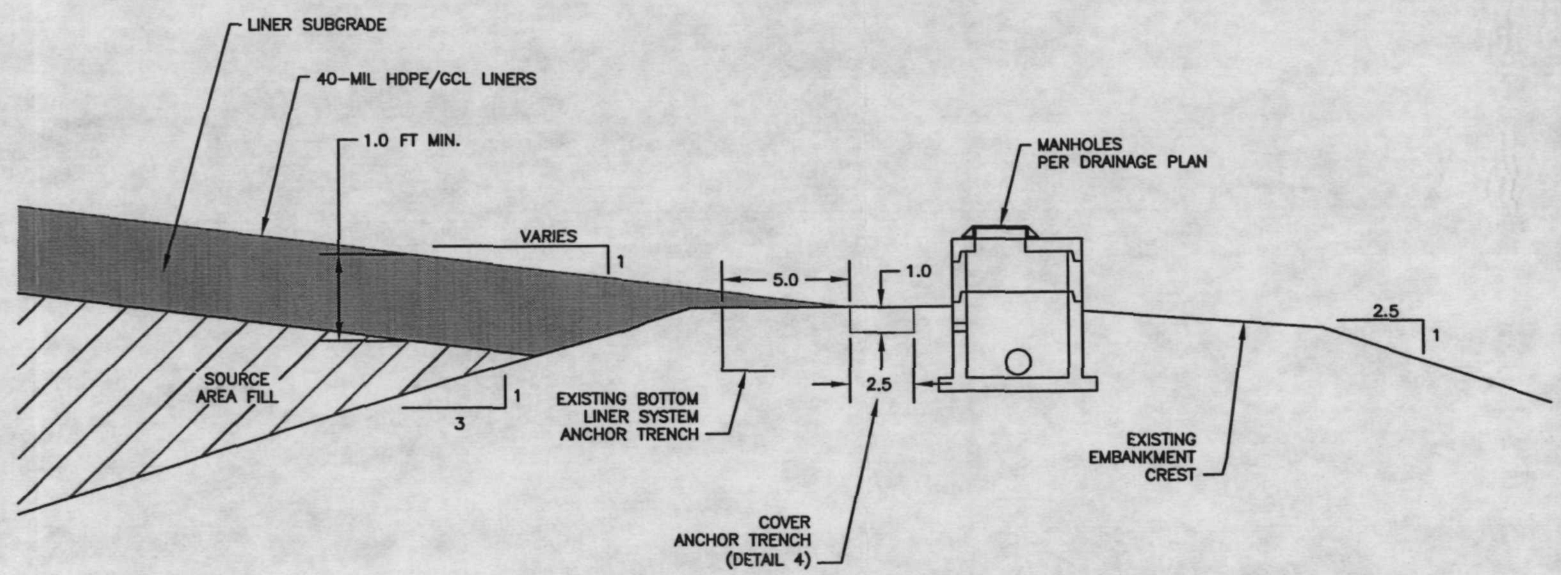
SCALE: 1" = 100'



SECTION A-A' - LINER SUBGRADE SECTION

SCALE IN FEET

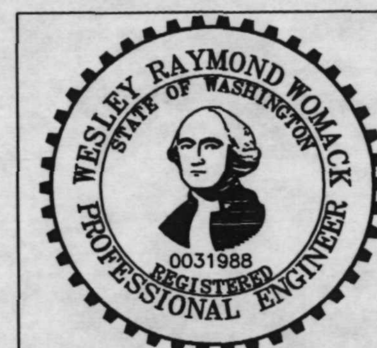
0 15 30 60



DETAIL 1 - LINER SUBGRADE TOE DETAIL

SCALE IN FEET

0 2 4 8



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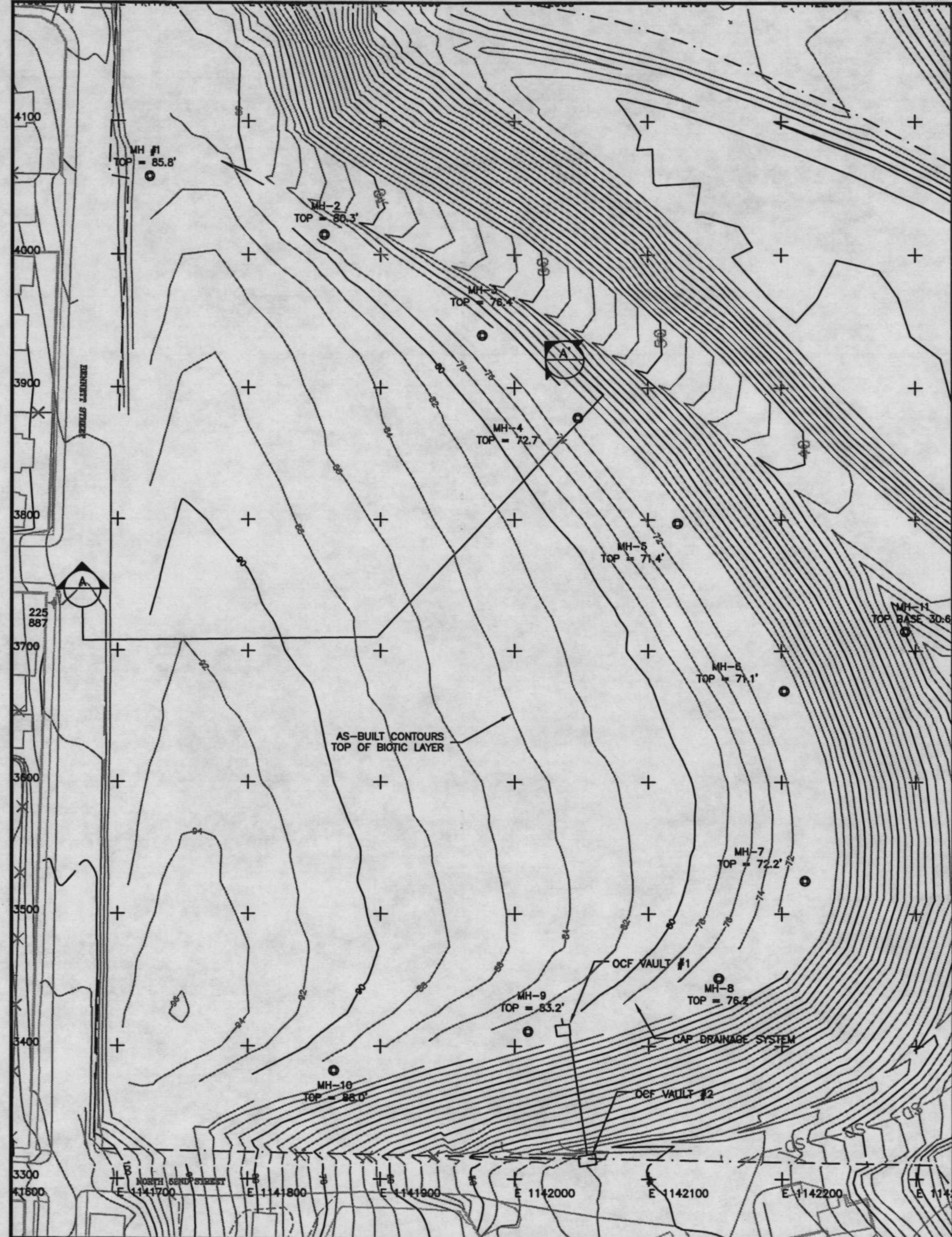
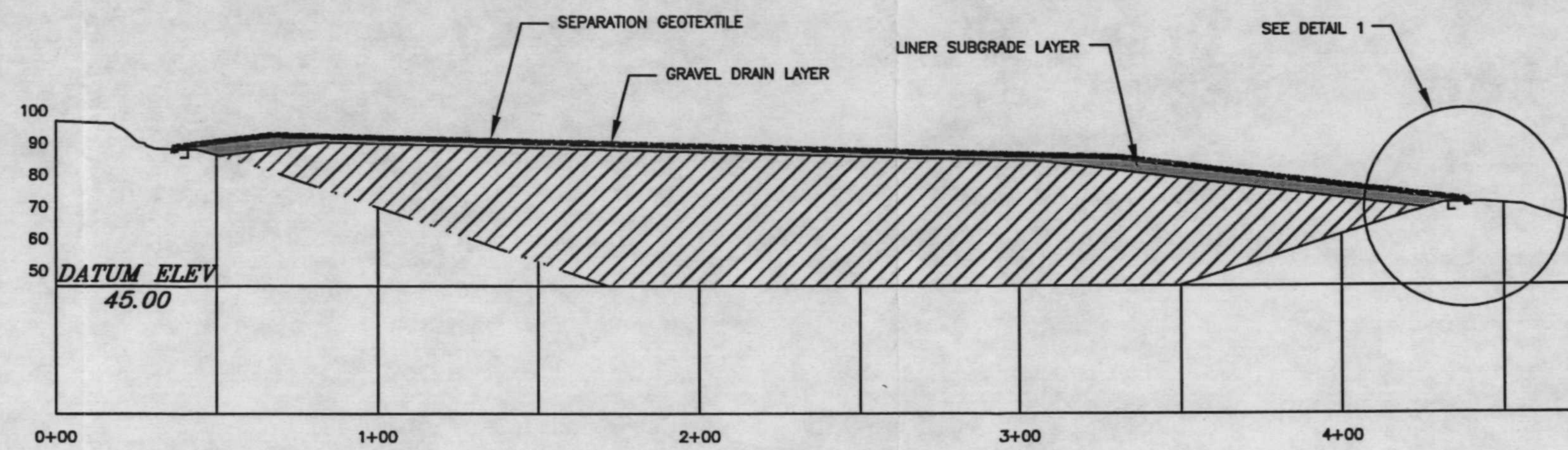
ASARCO LLC - TACOMA
OCF AS-BUILT REPORT
OCF COVER
LINER SUBGRADE LAYER

DRAWING FILE NUMBER
AB_OCF_10.dwg
AUTOCAD
FIGURE NUMBER 10
REV



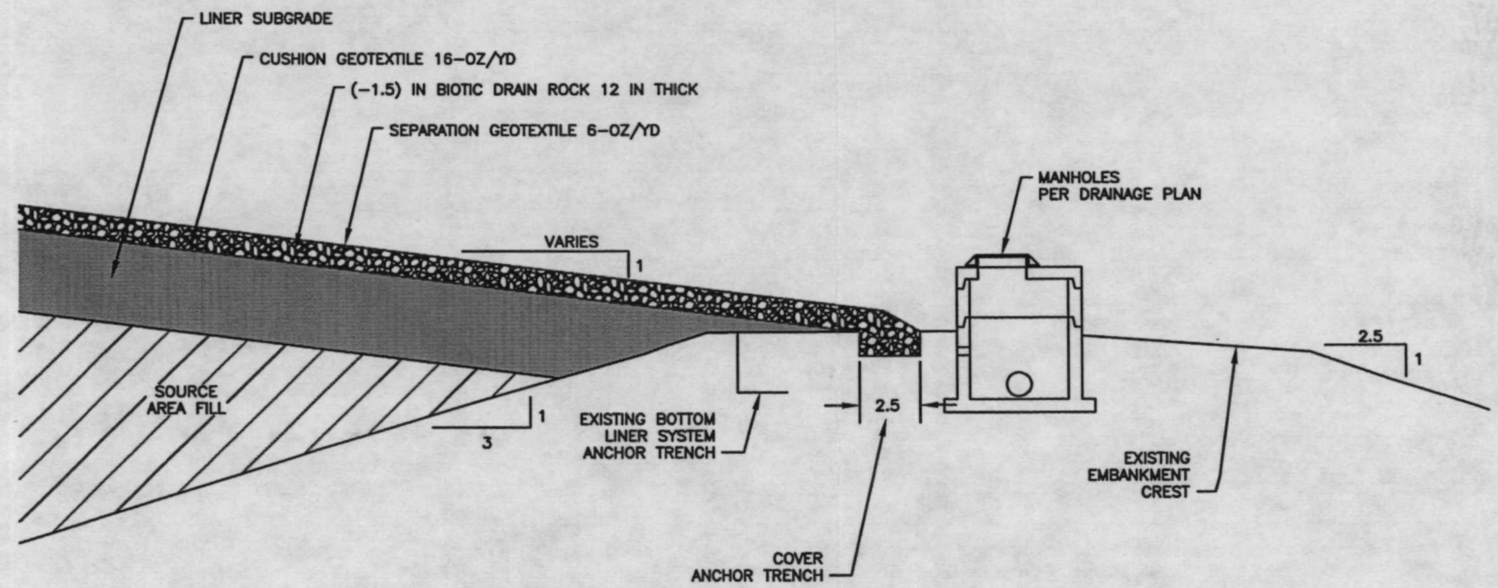
SITE PLAN

SCALE: 1" = 100'



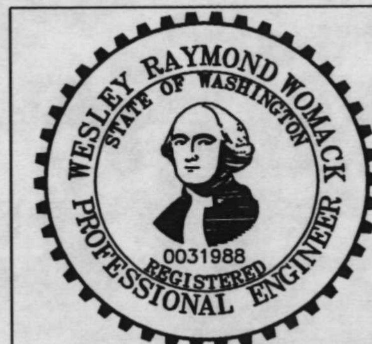
SECTION A-A' – GRAVEL DRAIN LAYER SECTION

SCALE IN FEET 0 15 30 60



DETAIL 1 – GRAVEL DRAIN TOE DETAIL

SCALE IN FEET 0 2 4 8



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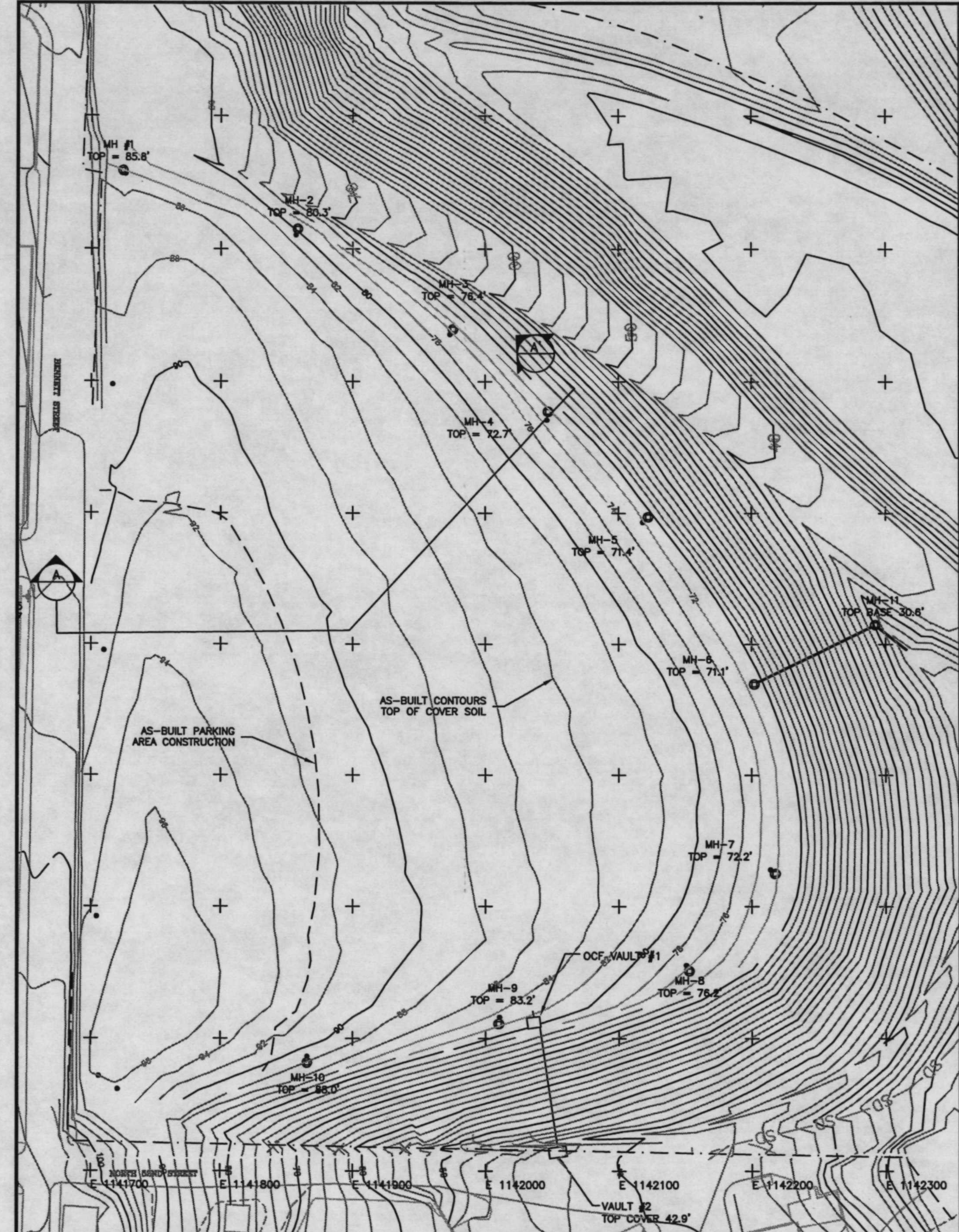
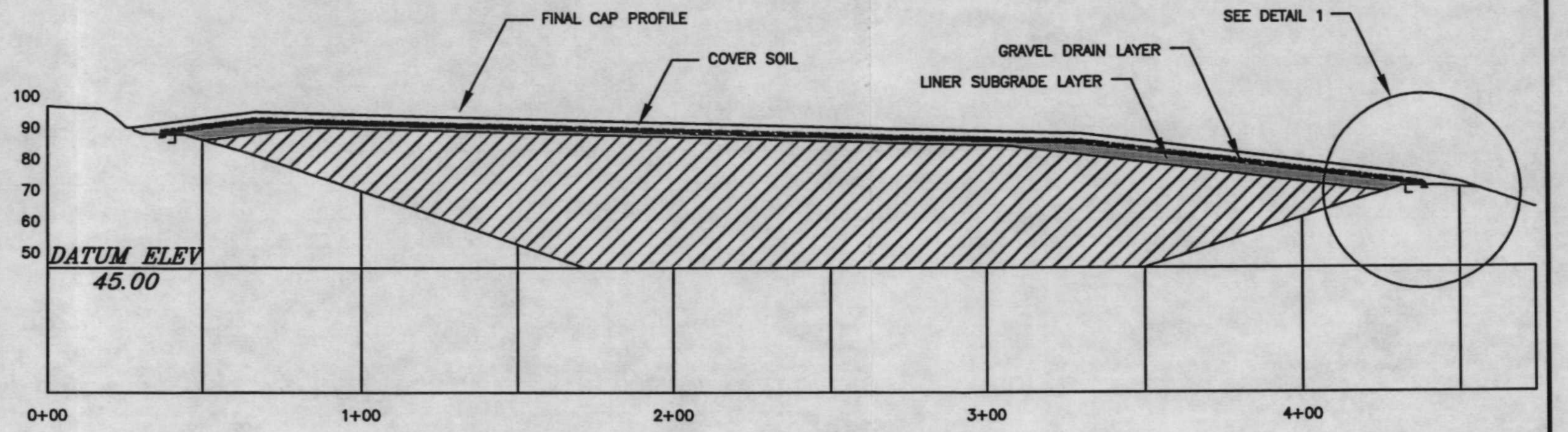
ASARCO LLC – TACOMA
OCF AS-BUILT REPORT
OCF COVER
BIOTIC DRAIN LAYER

DRAWING FILE NUMBER AB_OCF_11.dwg
AUTOCAD
FIGURE NUMBER 11
REV



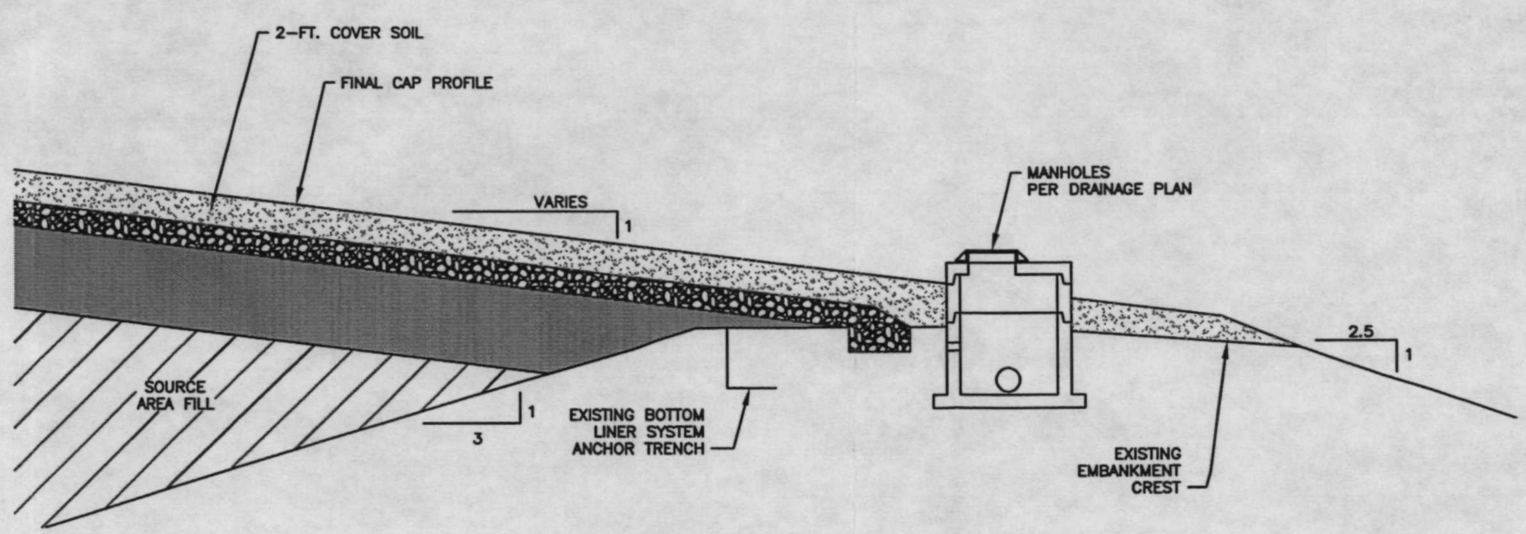
SITE PLAN

SCALE: 1" = 100'



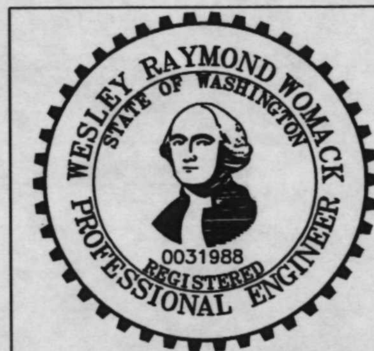
SECTION A-A' – FINAL COVER SECTION

SCALE IN FEET 0 15 30 60



DETAIL 1 – COVER SOIL LAYER TOE DETAIL

SCALE IN FEET 0 2 4 8



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REVISIONS NO	BY	DATE	DESCRIPTION

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
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CHECKED BY	dpc
APPROVED BY	wrw
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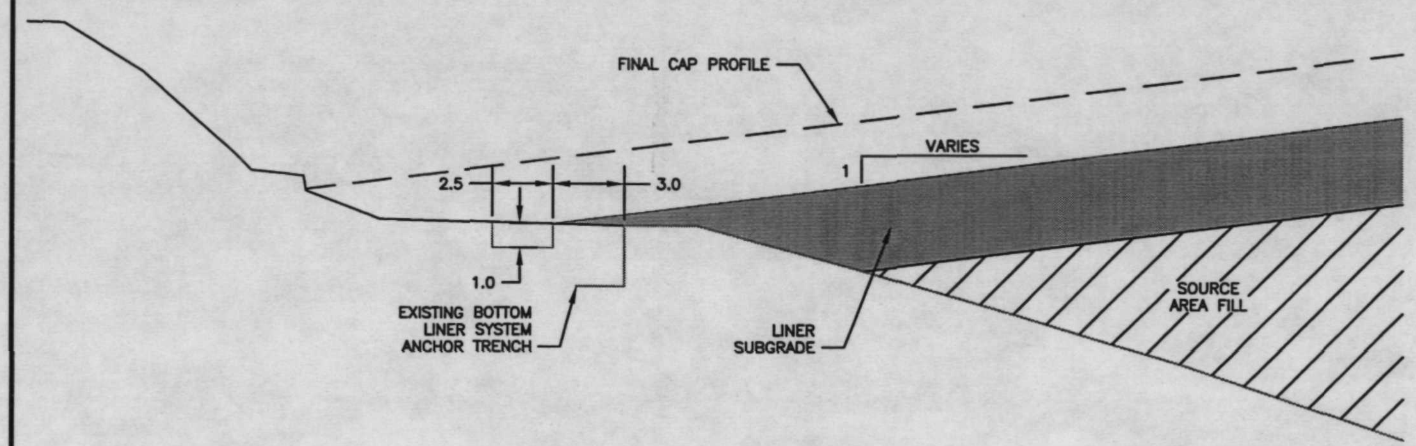
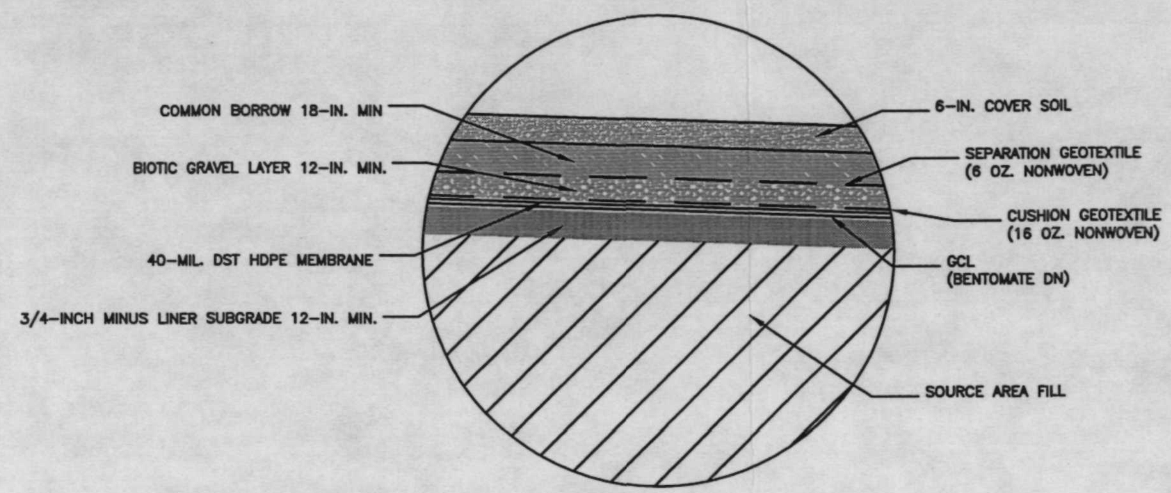
OCF AS-BUILT REPORT
OCF COVER
FINAL COVER SURFACE

DRAWING FILE NUMBER
AB_OCF_12.dwg
AUTOCAD
FIGURE NUMBER 12
REV △



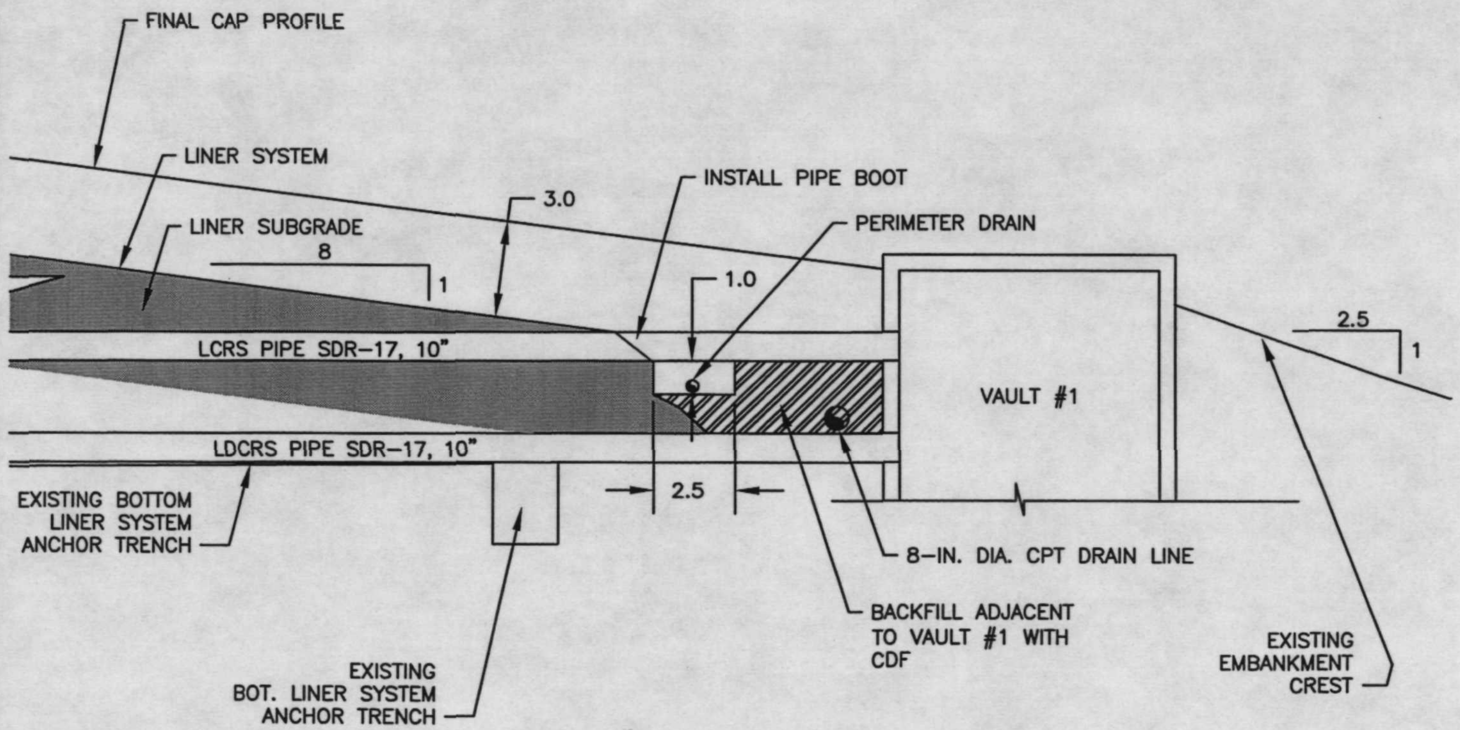
DETAIL 1 – WEST PERIMETER SECTION

SCALE IN FEET
0 2 4 8



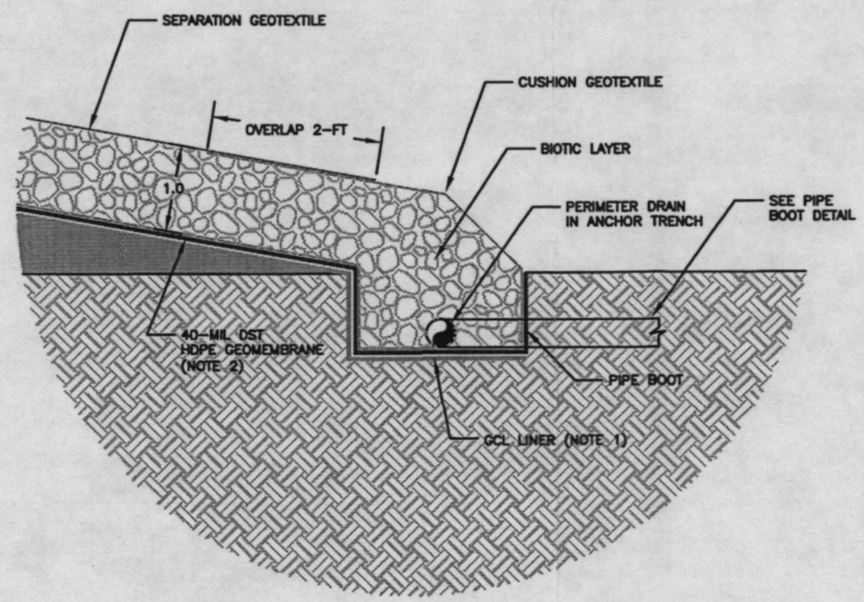
DETAIL 3 – TYPICAL COVER SECTION

NOT TO SCALE



DETAIL 2 – VAULT #1 SECTION

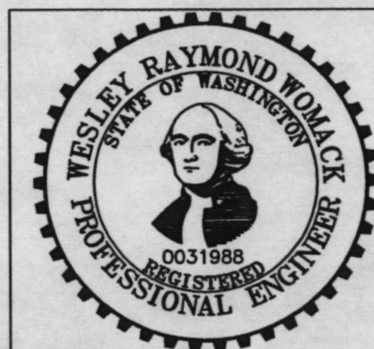
SCALE IN FEET
0 3 6



NOTES:
1. GCL ACROSS BOTTOM OF ANCHOR TRENCH ONLY.
2. HDPE LINER EXTENDS ACROSS SIDES AND BOTTOM OF ANCHOR TRENCH TO FORM LINED PERIMETER DRAIN SECTION.

DETAIL 4 – TYPICAL ANCHOR TRENCH SECTION

NOT TO SCALE



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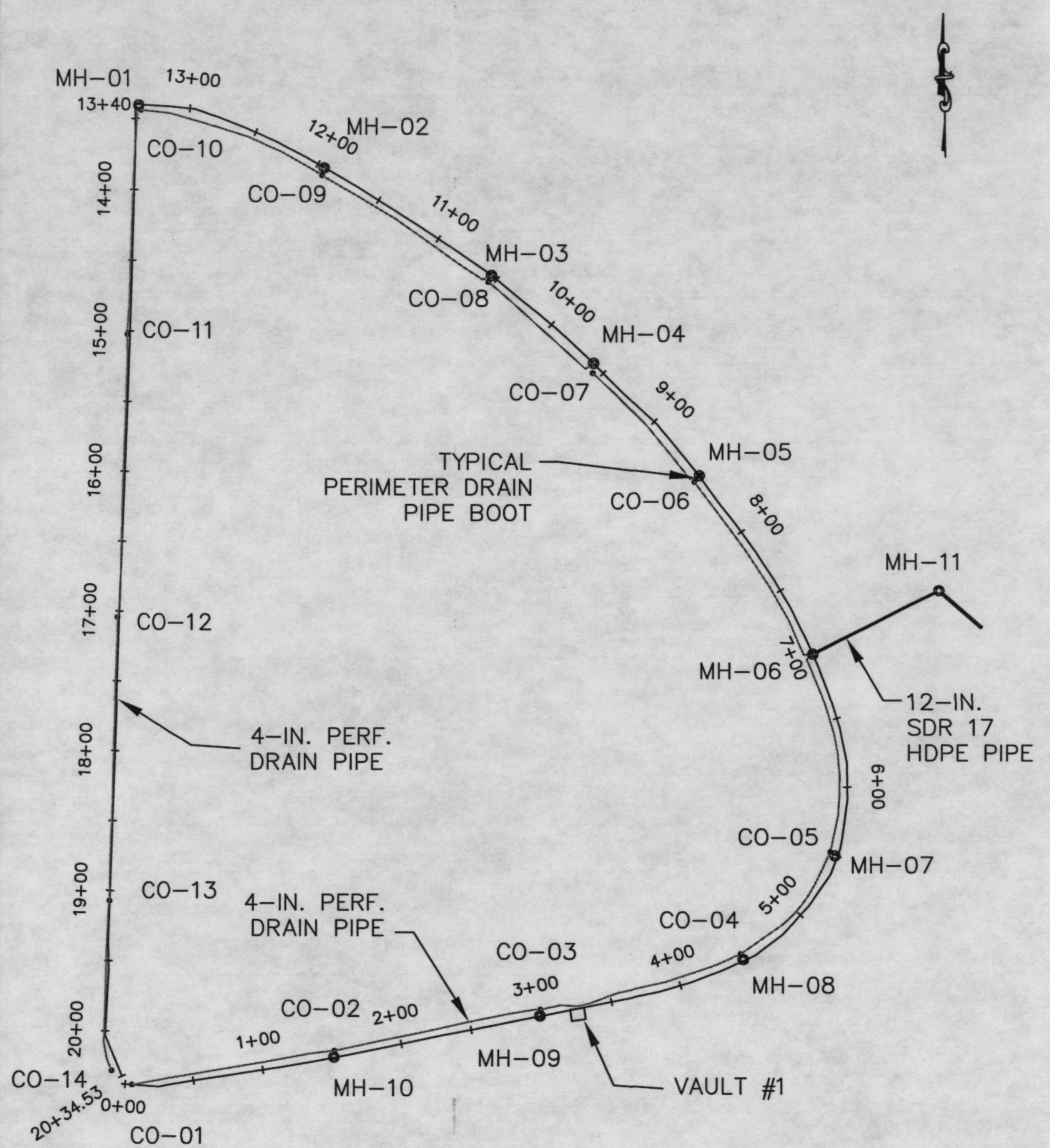
OCF COVER
TYPICAL DETAILS

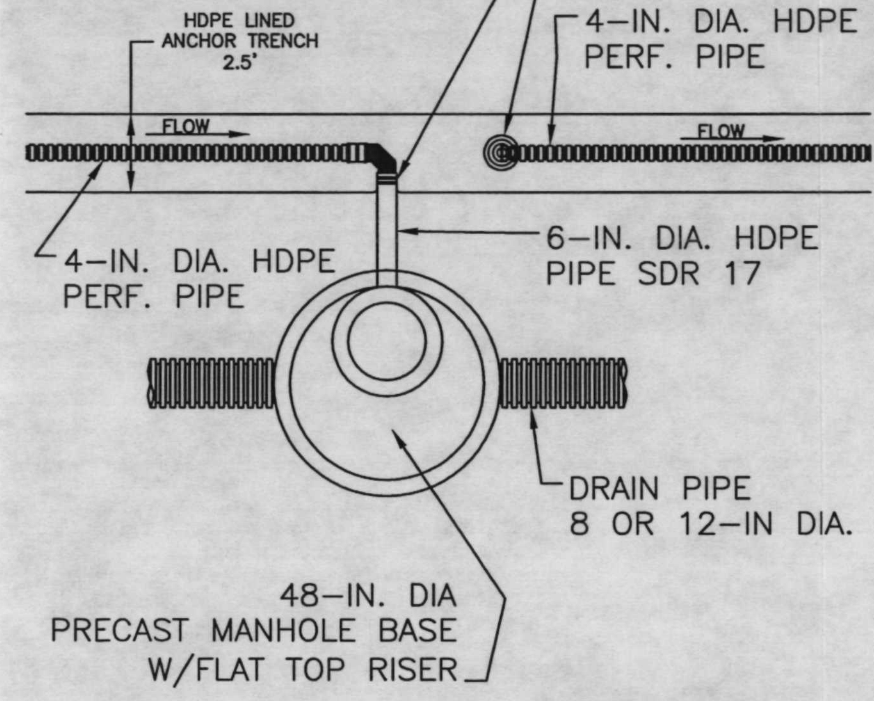
DRAWING FILE NUMBER
AB_OCF_13.dwg
AUTOCAD
FIGURE NUMBER 13
REV



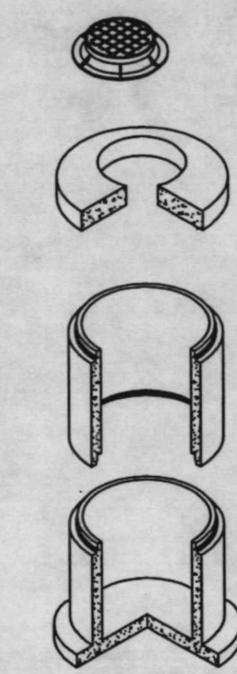
NOTE: 18 IN. DIA. PIPE FROM MH-11 DISCHARGES TO SURFACE WATER.

PERIMETER DRAIN ALIGNMENT LOCATION

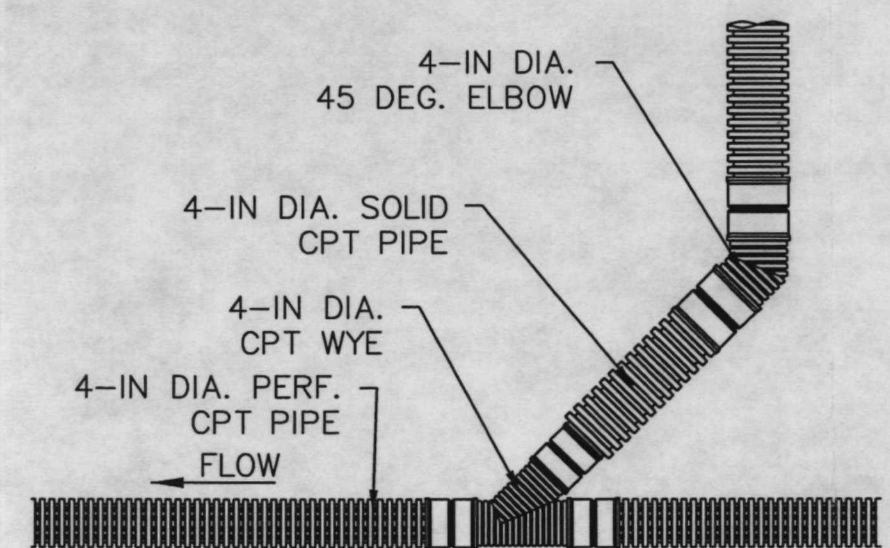
1" = 100'



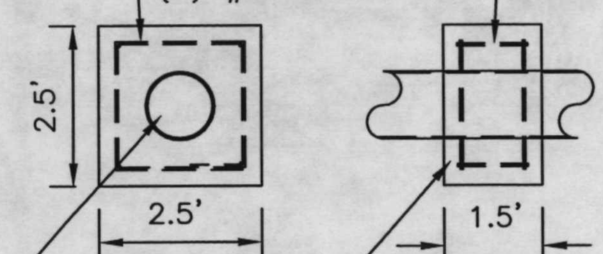
TYPICAL PERIMETER DRAIN MANHOLE CONNECTION



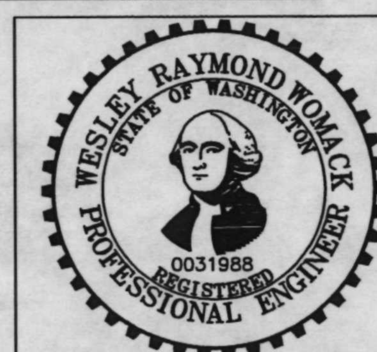
TYPICAL MANHOLE ASSEMBLY



CLEANOUT CONNECTION



TYPICAL PIPE ANCHOR DETAIL



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REVISIONS NO	BY	DATE	DESCRIPTION

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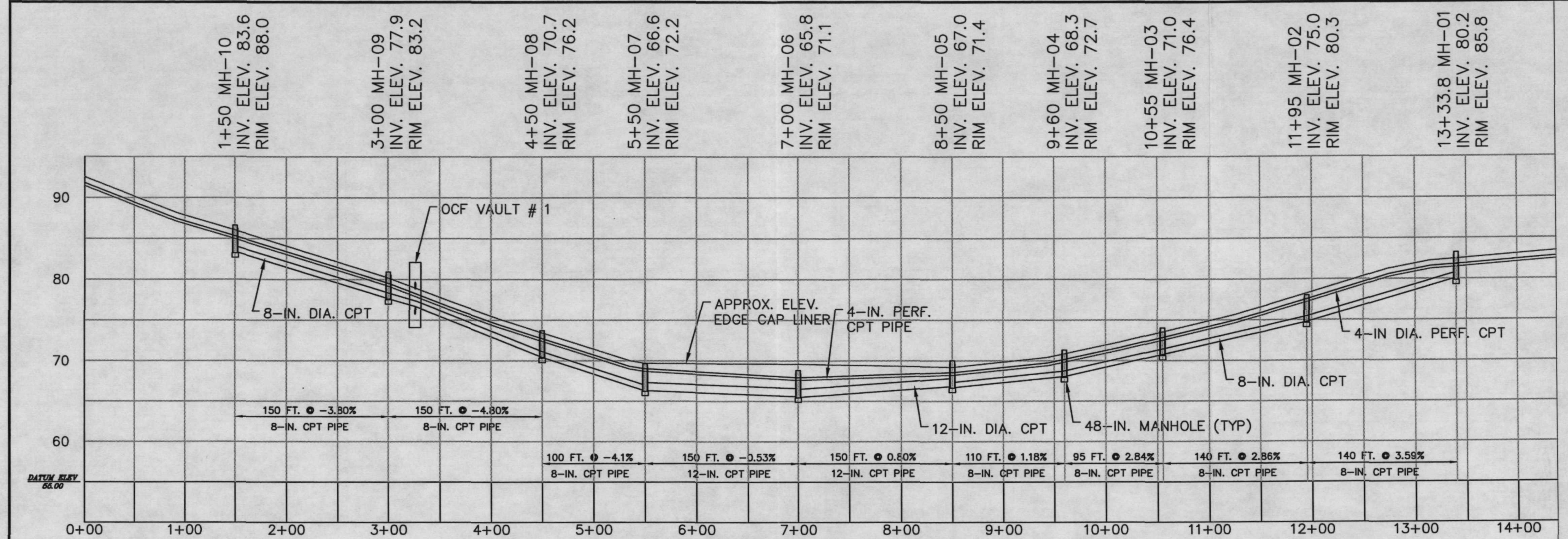
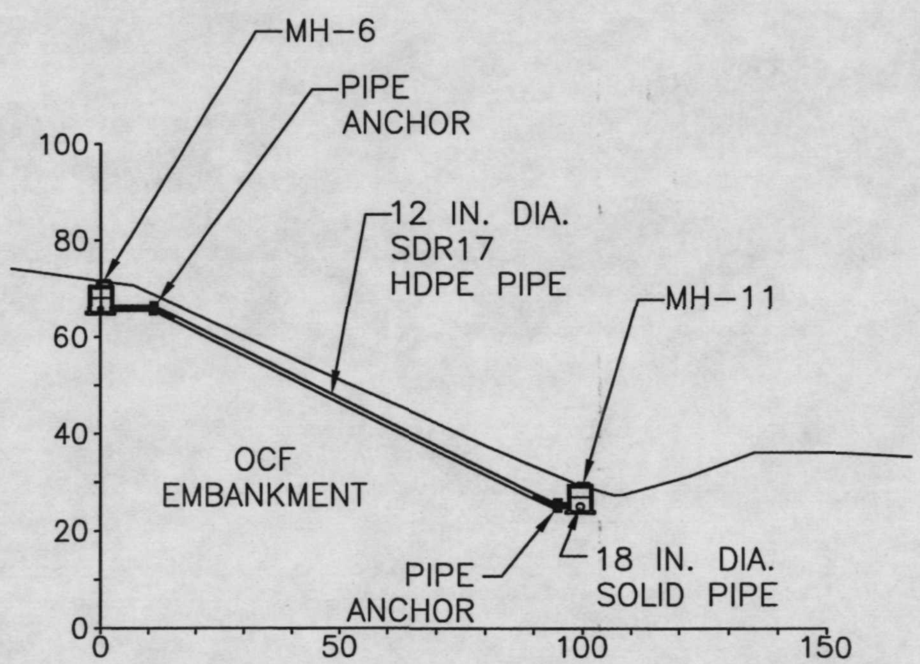
OCF COVER PERIMETER DRAIN SYSTEM
PLAN AND DETAILS

DRAWING FILE NUMBER
AUTOCAD
FIGURE NUMBER 14
REV



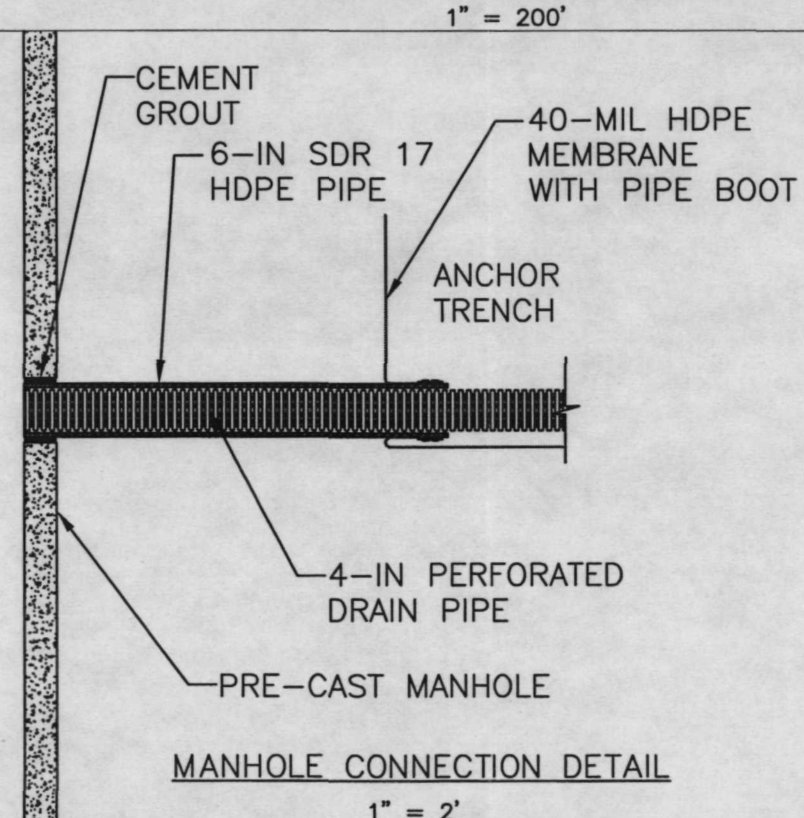
PERIMETER DRAIN ALIGNMENT PROFILE

1" = 200'



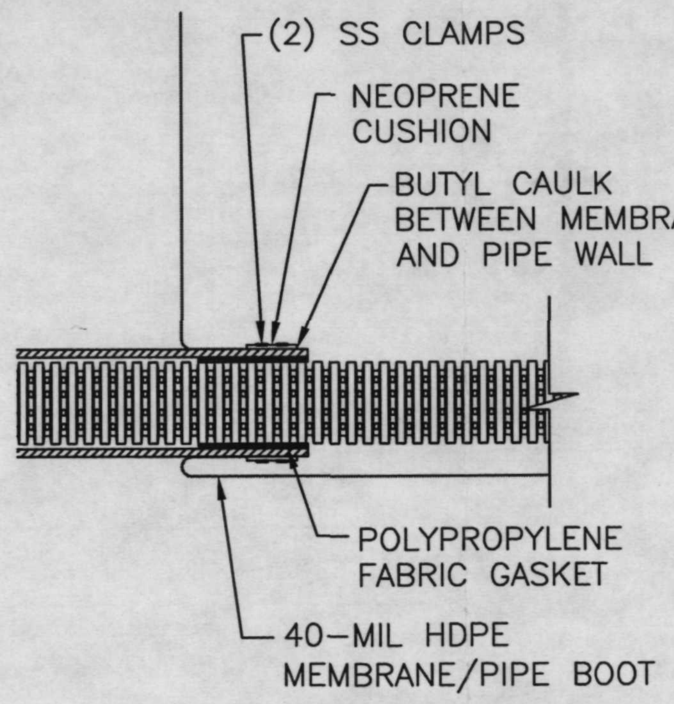
OCF MAIN COLLECTOR PROFILE

1" = 40'



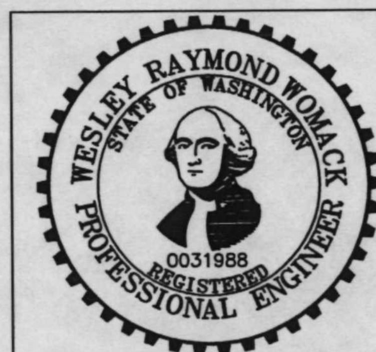
MANHOLE CONNECTION DETAIL

1" = 2'



PIPE BOOT TYPICAL DETAIL

1" = 1'



EXPIRES 8/17/07

REVISIONS NO	BY	DATE	DESCRIPTION

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
0 1.0
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OCF AS-BUILT REPORT
OCF COVER PERIMETER DRAIN
TYPICAL DETAILS

DRAWING FILE NUMBER
AUTOCAD
FIGURE NUMBER 15
REV

APPENDIX A

Construction Photos

Construction Photos 1999

Photo 99-1 view of site looking west during stripping operations.

Photo 99-2 view of site looking north prior to cell excavation.

Photo 99-3 wick drain installation rig in lower site.

Photo 99-4 DDC in area with wick drains installed.

Construction Photos 2001

Photo 01-1 CSL placement of east side of cell and temporary cover over completed CSL.

Photo 01-2 CSL placement at north end of cell.

Photo 01-3 excavation of LCRS/LDCRS trench on south side of cell.

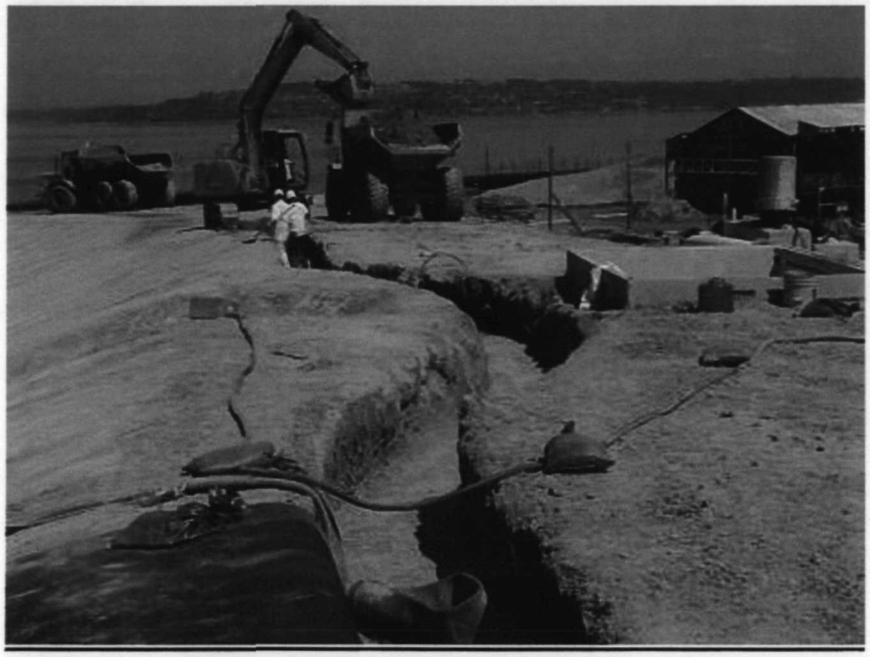

Photo 01-4 excavation of anchor trench for bottom liner near Vault #1.

Photo 01-5 placement of 12-inch CSL over LDCRS in cell bottom.

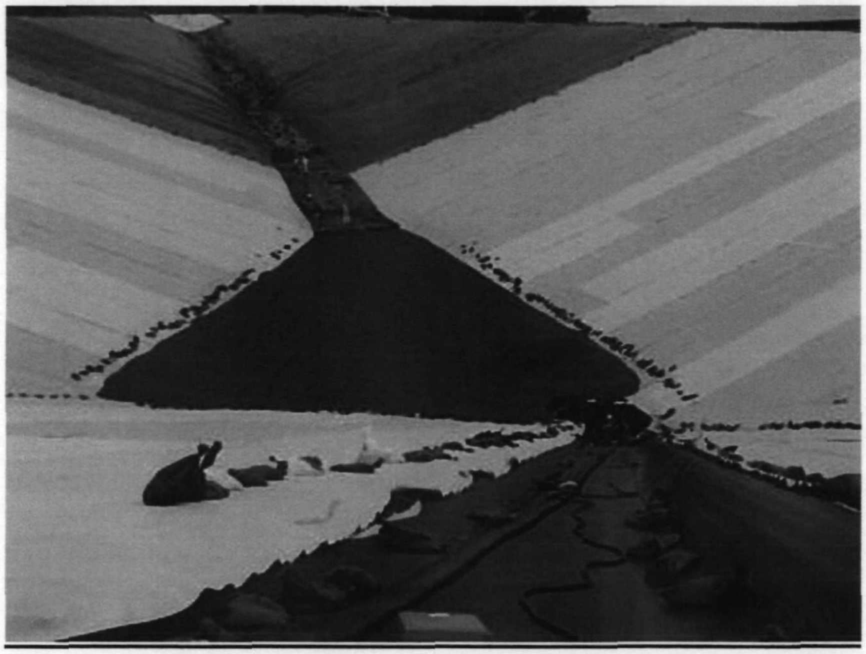

Photo 01-6 view of LCRS trench on south side of cell.

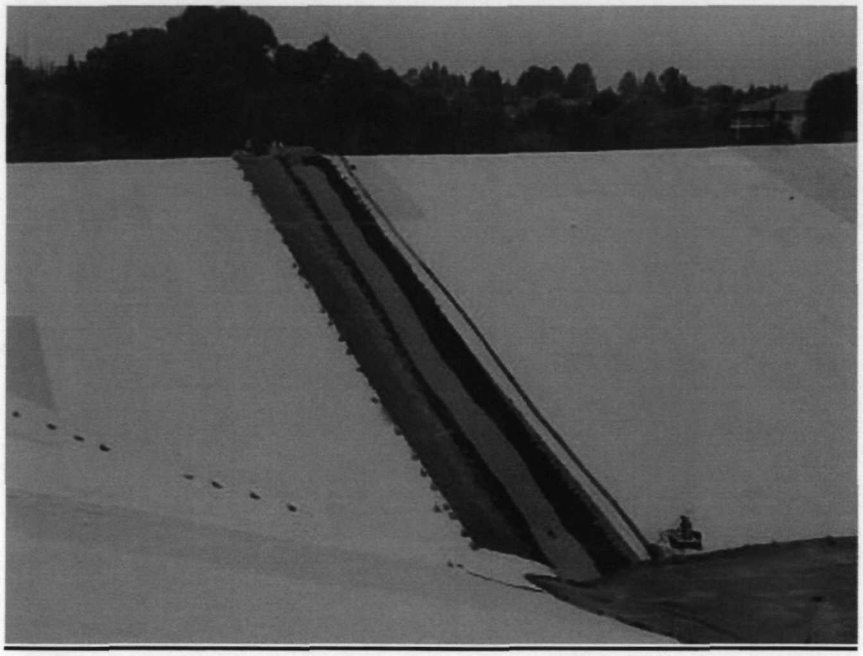

Photo 01-7 view of LCRS trench with pipe and drain rock placed.

Construction Photos 2003

Photo 03-1 Placement of cushion layer over bottom liner system prior to ramp construction.

Photo 03-2 – Beginning of fill placement for ramp in southwest corner of OCF.

Photo 03-3- ramp fill constructed from cell bottom up to southwest corner of OCF.

Photo 03-4- Geogrid anchor block backfilled with controlled density fill.

Photo 03-5- Removal of north ramp, exposing 3' CSL on adjacent slopes.

Photo 03-6- Placement of CSL in North Ramp, placement of South Ramp traffic surface (background).

Photo 03-7- Placement of HDPE panel over CSL in North Ramp area.

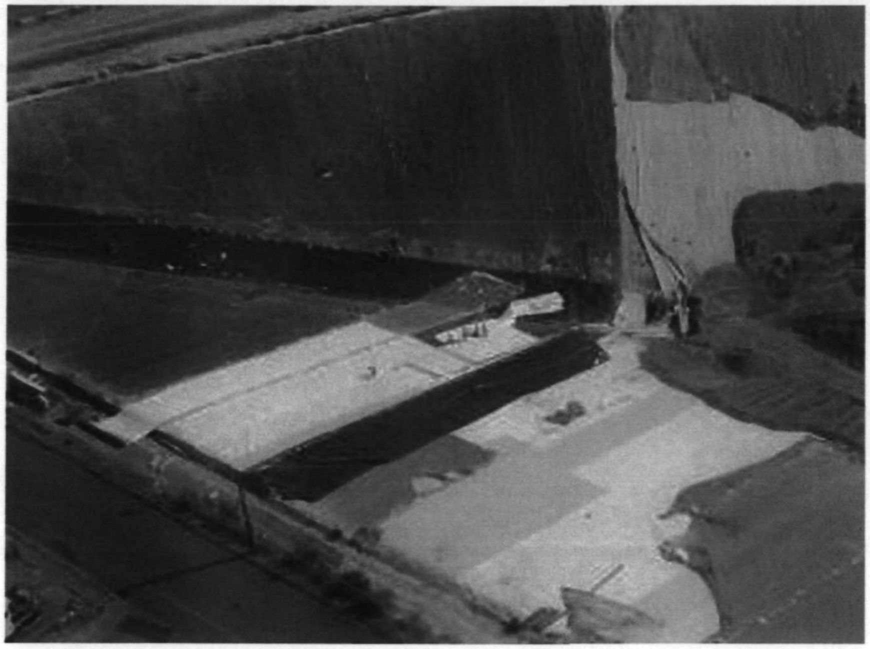

Photo 03-8- Areial view of geonet deployment over HDPE liner north end of OCF.

Photo 03-9- 60mil HDPE liner deployed in north ramp area over GCL and geonet.

Photo 03-10- extrusion weld on seam between liner panels deployed during 2001 and 2003.

Photo 3-11- backfill of anchor trench along western side of OCF cell.

Construction Photos 2004

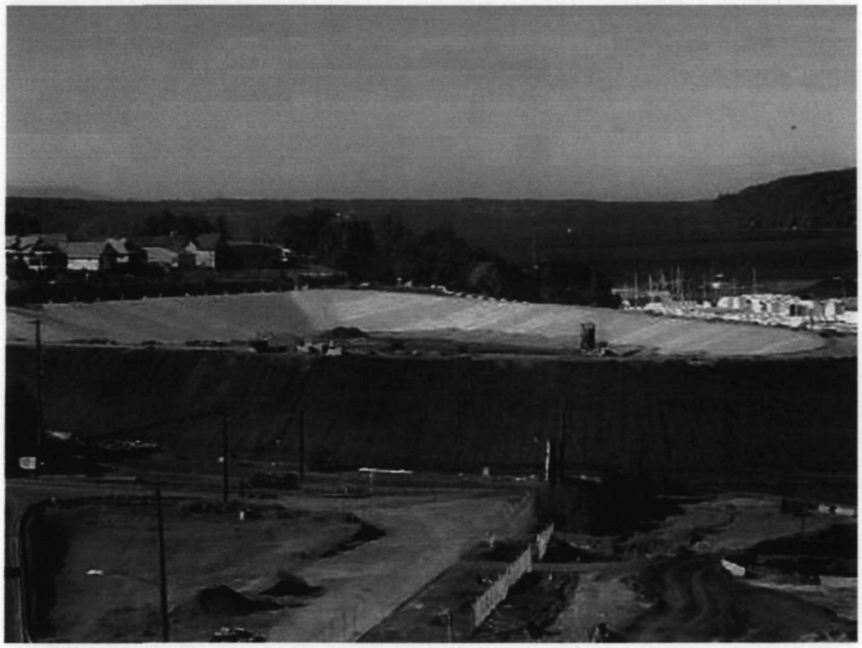

Photo 04- 1 Placement of SA backfill during fall 2004.

Photo 04- 2 Placement of SA backfill prior to installation of temporary cover (Fall 2004).

Photo 04- 3 Placement of SA backfill prior to installation of temporary cover (Fall 2005).

Construction Photos 2005

Photo 05-1 GCL deployment over cover subgrade.

Photo 05-2 cover system anchor trench along Bennett Street.

Photo 05-3 Fabrication of pipe boot to cover perimeter drain manhole.

Photo 05-4 Cushion geotextile (16 oz/yd) over HDPE membrane and cover system drain pipe.

Photo 05-5 Double boot on LCRS pipe through cover anchor adjacent to Vault #1.

Photo 05-6 Barge with conveyor system offloading biotic drain gravel.

Photo 05-7 View of biotic drain layer looking east.

Photo 05-8 Separation geotextile over cover biotic drain layer along Bennett Street.

Photo 05-9 Trench down embankment slope from MH-06 to MH-11.

Photo 05-10 Trench excavated from Vault #1 down to Vault #2.

Photo 05-11 Final cover grade after placement of six inch layer of cover soil.

Photo 05-12 Common borrow cover material (2-ft depth) within Bennett Street parking Area.

Photo 05-13 Installation of piping, electrical and telecommunications lines between Vaults 1& 2.

Photo 05-14 LCRS and LDCRS manifolds in Vault #1.

APPENDIX B

CQAP Tables

OCF Table 4-1. Testing of Soil and Bentonite Prior to Mixing

	Soil - Field		Soil - Lab											Bentonite - Lab										Grain Size Distribution			
Date	Visual Inspection (Y/N)	Pass/ Fail	Total Tons per Day	Total CY per Day	Running Total of 1000 CY of Soil	Required (1 per 1000 CY)	Sample No.	Percent Fines	Pass/ Fail (35 - 45%)	Percent Gravel	Pass/ Fail (<15%)	Liquid Limit	Plastic Limit	Total Tons per Day	Running Total of 50 Tons of Bentonite	Required (1 per 50 Tons)	Sample No.	Free Swell (ml/2 g)	Pass/ Fail [1]	Filtrate Loss (ml)	Pass/ Fail (<5% out from ≤ 15 ml)	Moisture Content (%)	Pass/ Fail (<5% out from ≤ 10% criteria)	Percent Gravel	Percent Sand	Percent Fines	Pass/ Fail (>70%)
7/10/2000	Y	Pass	682.13	401.3	401.3	0								0.00	0.0	0											
7/11/2000	Y	Pass	740.23	435.4	836.7	0								0.00	0.0	0											
7/12/2000	Y	Pass	762.21	448.4	1285.0	1								0.00	0.0	0											
7/13/2000	Y	Pass	988.5	581.5	866.5	0								0.00	0.0	0											
7/14/2000	Y	Pass	765.65	450.4	1316.9	1								100.85	100.9	2											
7/15/2000	N	-	0	0.0	316.9	0								0.00	0.8	0											
7/16/2000	N	-	0	0.0	316.9	0								0.00	0.8	0											
7/17/2000	Y	Pass	676.05	397.7	714.6	0								0.00	0.8	0											
7/18/2000	N	-	0	0.0	714.6	0	L-OCF-TBL4-1-S-1	31.2	Fail	25.0	Fail	NP	NP	0.00	0.8	0	L-OCFTBL4-1-B-1	21	Pass	13.8	Pass	6	Pass	0	5.3	94.7	Pass
							L-OCF-TBL4-1-S-2	32.7	Fail	21.7	Fail	NP	NP														
							L-OCF-TBL4-1-S-3	31.6	Fail	23.8	Fail	NP	NP														
7/19/2000	N	-	0	0.0	714.6	0								0.00	0.8	0											
7/20/2000	N	-	0	0.0	714.6	0								0.00	0.8	0											
7/21/2000	Y	Pass	733.65	431.6	1146.1	1								0.00	0.8	0											
7/22/2000	N	-	0	0.0	146.1	0								0.00	0.8	0											
7/23/2000	N	-	0	0.0	146.1	0								0.00	0.8	0											
7/24/2000	Y	Pass	756.69	445.1	591.2	0								0.00	0.8	0											
7/25/2000	N	-	0	0.0	591.2	0	L-OCF-TBL4-1-S-4	33.7	Fail	26.8	Fail	NP	NP	0.00	0.8	0											
7/26/2000	N	-	0	0.0	591.2	0								0.00	0.8	0											
7/27/2000	N	-	0	0.0	591.2	0								99.67	100.5	2											
7/28/2000	N	-	0	0.0	591.2	0								0.00	0.5	0											
7/29/2000	N	-	0	0.0	591.2	0								0.00	0.5	0											
7/30/2000	N	-	0	0.0	591.2	0								0.00	0.5	0											
7/31/2000	Y	Pass	677.29	398.4	989.6	0	L-OCF-TBL4-1-S-5	32.8	Fail	21.9	Fail	NP	NP	0.00	0.5	0	L-OCFTBL4-1-B-2	23	Pass	14	Pass	7	Pass	0	3.6	96.4	Pass
8/1/2000	Y	Pass	589.28	346.6	1336.3	1								99.05	99.6	1											
8/2/2000	Y	Pass	265.3	156.1	492.3	0								0.00	49.6	0	L-OCFTBL4-1-B-3	25	Pass	13.6	Pass	7	Pass	0	3.7	96.3	Pass
8/3/2000	N	-	0	0.0	492.3	0								0.00	49.6	0											
8/4/2000	Y	Pass	392.34	230.8	723.1	0								97.56	147.1	2	L-OCFTBL4-1-B-4	22	Pass	13.2	Pass	7	Pass	0	2.4	97.6	Pass
8/5/2000	N	-	0	0.0	723.1	0								0.00	47.1	0											
8/6/2000	N	-	0	0.0	723.1	0								0.00	47.1	0											
8/7/2000	Y	Pass	408.6	240.4	963.5	0								0.00	47.1	0	L-OCFTBL4-1-B-5	22	Pass	13.2	Pass	7	Pass	0	3.9	96.1	Pass
8/8/2000	Y	Pass	758.73	446.3	1409.8	1								40.92	88.1	1											
8/9/2000	Y	Pass	567.75	334.0	743.8	0								0.00	38.1	0											
8/10/2000	Y	Pass	546.12	321.2	1065.0	1	L-OCF-TBL4-1-S-6	38.6	Pass	12.5	Pass	NP	NP	25.51	63.6	1	L-OCFTBL4-1-B-6	22	Pass	14	Pass	7	Pass	0	3.4	96.6	Pass
8/11/2000	N	-	0	0.0	65.0	0								71.61	85.2	1											
8/12/2000	N	-	0	0.0	65.0	0								0.00	35.2	0											
8/13/2000	N	-	0	0.0	65.0	0								0.00	35.2	0											
8/14/2000	Y	Pass	676.86	398.2	463.2	0								0.00	35.2	0											
8/15/2000	Y	Pass	677.46	398.5	861.7	0	L-OCF-TBL4-1-S-7	34.8	Fail	18.8	Fail	NP	NP	30.21	65.4	1	L-OCFTBL4-1-B-7	21	Pass	13.8	Pass	8	Pass	0	3.0	97.0	Pass
																	L-OCFTBL4-1-B-8	21	Pass	14	Pass	7	Pass	0	3.9	96.1	Pass
8/16/2000	Y	Pass	677.23	398.4	1260.0	1	L-OCF-TBL4-1-S-8	29.7	Fail	17.1	Fail	NP	NP	27.08	42.5	0	L-OCFTBL4-1-B-9	22	Pass	13.6	Pass	7	Pass	0	2.9	97.1	Pass
8/17/2000	Y	Pass	521.59	306.8	566.9	0	L-OCF-TBL4-1-S-9	31.4	Fail	22.9	Fail	NP	NP	88.61	131.1	2	L-OCFTBL4-1-B-10	23	Pass	14.4	Pass	7	Pass	0	3.5	96.5	Pass
																	L-OCFTBL4-1-B-11	18	Fail (outlier)	>15	Fail (outlier)	3	Pass	0	13.4	86.6	Pass
8/18/2000	Y	Pass	811.07	477.1	1044.0	1	L-OCF-TBL4-1-S-10	29.5	Fail	25.9	Fail	NP	NP	36.47	67.5	1	L-OCFTBL4-1-B-12	23	Pass	13.8	Pass	7	Pass	0	3.8	96.2	Pass
8/19/2000	N	-	0	0.0	44.0	0								0.00	17.5	0											
8/20/2000	N	-	0	0.0	44.0	0								0.00	17.5	0											
8/21/2000	Y	Pass	752.92	442.9	486.9	0	L-OCF-TBL4-1-S-11	32.9	Fail	17.7	Fail	NP	NP	0.00	17.5	0											
8/22/2000	Y	Pass	1087.67	639.8	1126.7	1	L-OCF-TBL4-1-S-12	22.6	Fail	42.4	Fail	NP	NP	62.69	80.2	1	L-OCFTBL4-1-B-13	22	Pass	13.8	Pass	7	Pass	0	4.3	95.7	Pass
8/23/2000	Y	Pass	770.74	453.4	580.0	0	L-OCF-TBL4-1-S-13	26.5	Fail	29.4	Fail	NP	NP	91.37	121.6	2	L-OCFTBL4-1-B-14	22	Pass	14	Pass	7	Pass	0	4.8	95.2	Pass
							L-OCF-TBL4-1-S-14	30.9	Fail	21.1	Fail	NP	NP				L-OCFTBL4-1-B-15	22	Pass	13.6	Pass	7	Pass	0	3.7	96.3	Pass
8/24/2000	Y	Pass	753.05	443.0	1023.0	1	L-OCF-TBL4-1-S-15	35.3	Pass	12.2	Pass	NP	NP	95.19	116.8	2	L-OCFTBL4-1-B-16	21	Pass	14	Pass	7	Pass	0	4.1	95.9	Pass
																	L-OCFTBL4-1-B-17	21	Pass	13.8	Pass	7	Pass	0	4.1	95.9	Pass
8/25/2000	Y	Pass	621.05	365.3	388.3	0	L-OCF-TBL4-1-S-16	33.2	Fail	16.2	Fail	NP	NP	98.48	115.3	2	L-OCFTBL4-1-B-18	22	Pass	13.8	Pass	6	Pass	0	5.8	94.2	Pass
8/26/2000	N	-	0	0.0	388.3	0	L-OCF-TBL4-1-S-17	32.6	Fail	22.3	Fail	NP	NP	169.98	185.3	3	L-OCFTBL4-1-B-19	21.5	Pass	14.4	Pass	7	Pass	0	3.2	96.8	Pass
																	L-OCFTBL4-1-B-20	20	Fail (outlier)	13.8	Pass	7	Pass	0	5.0	95.0	Pass
8/27/2000	N	-	0	0.0	388.3	0								0.00	35.3	0											
8/28/2000	Y	Pass	1082.61	636.8	1025.2	1	L-OCF-TBL4-1-S-18	33.9	Fail	19.4	Fail	NP	NP	35.39	70.6	1	L-OCFTBL4-1-B-21	21.5	Pass	13.8	Pass	7	Pass	0	4.5	95.5	Pass
8/29/2000	Y	Pass	1508.62	887.4	912.6	0	L-OCF-TBL4-1-S-19	31.7	Fail	24.3	Fail	NP	NP	0.00	20.6	0	L-OCFTBL4-1-B-22	21	Pass	13.6	Pass	6	Pass	0	3.9	96.1	Pass
8/30/2000	Y	Pass	1311.71	771.6	1684.2	1								0.00	20.6	0											
8/31/2000	Y	Pass	898.08	528.3	1212.5	1	L-OCF-TBL4-1-S-20	33.5	Fail	25.8	Fail	NP	NP	102.63	123.3	2	L-OCFTBL4-1-B-23	22	Pass	13	Pass	7	Pass	0	3.3	96.7	Pass
							L-OCF-TBL4-1-S-21	29.5	Fail	32.7	Fail	NP	NP														
9/1/2000	N	-	0	0.0	212.5	0								38.89	62.2	1											
9/2/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/3/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/4/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/5/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/6/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/7/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/8/2000	N	-	0	0.0	212.5	0								0.00	12.2	0											
9/9/2000	N	-	0	0.0	212.5	0								0.00	12.2	0	L-OCFTBL4-1-B-24	21.5	Pass	13	Pass	8	Pass	0	3.2	96.7	Pass
																	L-OCFTBL4-1-B-25	21.5	Pass	13.2	Pass	6	Pass	0	3.1	96.9	Pass
9/10/2000	N	-	0	0.0	212.5	0																					
9/11/2000	Y	Pass	646.28	380.2	592.6	0	L-OCF-TBL4-1-S-22	35.9	Pass	18.6	Fail	NP	NP	0.00	12.2	0	L-OCFTBL4-1-B-26	21.5	Pass	13.2	Pass	7	Pass	0	1.6	98.4	Pass
9/12/2000	Y	Pass	568.08	334.2	926.8	0	L-OCF-TBL4-1-S-23	32.4	Fail	25.3	Fail	NP	NP	98.00	110.2	2	L-OCFTBL4-1-B-27	22.5	Pass	29.4	Fail (outlier)	7	Pass	0	5.6	94.4	Pass
9/13/2000	Y	Pass	591.33	347.8	1274.6	1	L-OCF-TBL4-1-S-24	32.6	Fail	16	Fail	NP	NP	101.46	111.6	2	L-OCFTBL4-1-B-28	21.5	Pass	12.8	Pass	8	Pass	0	3.8	96.2	Pass

Note 1: Tests performed consistent with ASTM D 5890. Rejection criteria is no more than 5% of samples outside of limits established by Project Specifications (≥ 24 ml/2g) or test pad program (≥ 21 ml/2g). The Project Specifications for free swell was established based on tests performed using ACC 1010.

OCF Table 4-1. Testing of Soil and Bentonite Prior to Mixing

Date	Soil - Field		Soil - Lab											Bentonite - Lab										Grain Size Distribution			
	Visual Inspection (Y/N)	Pass/ Fail	Total Tons per Day	Total CY per Day	Running Total of 1000 CY of Soil	Required (1 per 1000 CY)	Sample No.	Percent Fines	Pass/ Fail (35 - 45%)	Percent Gravel	Pass/ Fail (<15%)	Liquid Limit	Plastic Limit	Total Tons per Day	Running Total of 50 Tons of Bentonite	Required (1 per 50 Tons)	Sample No.	Free Swell (ml/2 g)	Pass/ Fail [1]	Filtrate Loss (ml)	Pass/ Fail (<5% out from ≤ 15 ml)	Moisture Content (%)	Pass/ Fail (<5% out from ≤ 10% criteria)	Percent Gravel	Percent Sand	Percent Fines	Pass/ Fail (>70%)
																	L-OCFTBL4-1-B-29	21.5	Pass	13.2	Pass	7	Pass	0	4	96	Pass
9/14/2000	Y	Pass	631.43	371.4	646.1	0	L-OCF-TBL4-1-S-25	31.6	Fail	19.1	Fail	NP	NP	71.78	83.4	1	L-OCFTBL4-1-B-30	22/28[2]	Pass	13	Pass	7	Pass	0	2.9	97.1	Pass
9/15/2000	Y	Pass	1281.24	753.7	1399.7	1	L-OCF-TBL4-1-S-26	36.1	Pass	12.4	Pass	NP	NP	141.42	174.8	3	L-OCFTBL4-1-B-31	22/25[2]	Pass	13	Pass	7	Pass	0	3.5	96.6	Pass
																	L-OCFTBL4-1-B-32	22/24[2]	Pass	12.8	Pass	7	Pass	0	1.9	98.1	Pass
9/16/2000	N	-	0	0.0	399.7	0								66.48	91.3	1	L-OCFTBL4-1-B-33	21.5/24[2]	Pass	12.4	Pass	7	Pass	0	2.1	97.9	Pass
																	L-OCFTBL4-1-B-34	22/24[2]	Pass	12.8	Pass	7	Pass	0	4.1	95.9	Pass
9/17/2000	N	-	0	0.0	399.7	0								0.00	41.3	0											
9/18/2000	Y	Pass	1317.05	774.7	1174.5	1	L-OCF-TBL4-1-S-27	37.3	Pass	12.1	Pass	NP	NP	66.48	107.8	2	L-OCFTBL4-1-B-35	21.5/23[2]	Pass	12.8	Pass	8	Pass	0	2.7	97.3	Pass
																	L-OCFTBL4-1-B-36	22/24[2]	Pass	12	Pass	8	Pass	0	2.3	97.7	Pass
9/19/2000	Y	Pass	467.06	274.7	449.2	0	L-OCF-TBL4-1-S-28	38.8	Pass	12.6	Pass	NP	NP	98.19	106.0	2	L-OCFTBL4-1-B-37	21.5/26[2]	Pass	13.6	Pass	8	Pass	0	4.1	95.7	Pass
																	L-OCFTBL4-1-B-38	23	Pass	13.2	Pass	8	Pass	0	3.1	96.8	Pass
9/20/2000	Y	Pass	1065.15	626.6	1075.8	1	L-OCF-TBL4-1-S-29	40.6	Pass	8.4	Pass	NP	NP	34.07	40.0	0	L-OCFTBL4-1-B-39	23	Pass	13.2	Pass	8	Pass	0	3.8	96	Pass
																	L-OCFTBL4-1-B-40	22.5	Pass	13.2	Pass	8	Pass	0	4	95.9	Pass
9/21/2000	Y	Pass	846.37	497.9	573.6	0	L-OCF-TBL4-1-S-30	32.5	Fail	20	Fail	NP	NP	99.88	139.9	2											
9/22/2000	Y	Pass	894.36	526.1	1099.7	1	L-OCF-TBL4-1-S-31	37.9	Pass	16.3	Fail	NP	NP	105.77	145.7	2	L-OCFTBL4-1-B-41	23	Pass	14	Pass	7	Pass	0	4.1	95.7	Pass
																	L-OCFTBL4-1-B-42	21.5	Pass	13.2	Pass	7	Pass	0	4	95.9	Pass
9/23/2000	N	-	0	0.0	99.7	0	L-OCF-TBL4-1-S-32	28	Fail	27.3	Fail	NP	NP	102.47	148.2	2											
9/24/2000	N	-	0	0.0	99.7	0								0.00	48.2	0											
9/25/2000	Y	Pass	448.14	263.6	363.3	0	L-OCF-TBL4-1-S-33	39.2	Pass	14.6	Pass	NP	NP	64.59	112.8	2	L-OCFTBL4-1-B-43	24	Pass	13.8	Pass	7	Pass	0	3.3	96.6	Pass
9/26/2000	Y	Pass	1037.75	610.4	973.8	0	L-OCF-TBL4-1-S-34	31.3	Fail	21.3	Fail	NP	NP	34.56	47.3	0	L-OCFTBL4-1-B-44	22	Pass	13.6	Pass	8	Pass	0	2.1	97.9	Pass
9/27/2000	Y	Pass	1212.9	713.5	1687.2	1	L-OCF-TBL4-1-S-35	33.2	Fail	21.6	Fail	NP	NP	0.00	47.3	0	L-OCFTBL4-1-B-45	22	Pass	13.6	Pass	7	Pass	0	3	97	Pass
9/28/2000	Y	Pass	1191.54	700.9	1388.2	1	L-OCF-TBL4-1-S-36	29.1	Fail	26.7	Fail	NP	NP	0.00	47.3	0											
9/29/2000	Y	Pass	1188.19	698.9	1087.1	1								0.00	47.3	0											
9/30/2000	N	-	0	0.0	87.1	0								0.00	47.3	0											
10/1/2000	N	-	0	0.0	87.1	0								0.00	47.3	0											
10/2/2000	Y	Pass	1010.6	594.5	681.6	0								0.00	47.3	0											
10/3/2000	Y	Pass	520.93	306.4	988.0	0								109.47	156.8	3											
10/4/2000	Y	Pass	603.76	355.2	1343.1	1								108.68	115.5	2											
10/5/2000	Y	Pass	825.1	485.4	828.5	0	L-OCF-TBL4-1-S-37	35.3	Pass	17.4	Fail	NP	NP	0.00	15.5	0	L-OCFTBL4-1-B-46	22.5	Pass	13.8	Pass	8	Pass	0	4.2	95.7	Pass
							L-OCF-TBL4-1-S-38	34.3	Fail	16.3	Fail	NP	NP				L-OCFTBL4-1-B-47	22	Pass	12.8	Pass	8	Pass	0	4.4	95.4	Pass
							L-OCF-TBL4-1-S-39	34.7	Fail	15.6	Fail	NP	NP														
10/6/2000	Y	Pass	95.97	56.5	884.9	0								0.00	15.5	0											
10/7/2000	N	-	0	0.0	884.9	0	L-OCF-TBL4-1-S-40	31.5	Fail	23.8	Fail	NP	NP	108.08	123.5	2	L-OCFTBL4-1-B-48	21.5	Pass	14	Pass	8	Pass	0	5.2	94.6	Pass
10/8/2000	N	-	0	0.0	884.9	0								0.00	23.5	0											
10/9/2000	Y	Pass	93.73	55.1	940.1	0								0.00	23.5	0											
10/10/2000	N	-	0	0.0	940.1	0								67.99	91.5	1											
10/11/2000	Y	Pass	537.14	316.0	1256.0	1	L-OCF-TBL4-1-S-41	32.1	Fail	22.9	Fail	NP	NP	69.00	110.5	2	L-OCFTBL4-1-B-49	23.5	Pass	14	Pass	7	Pass	0	4.8	95	Pass
																	L-OCFTBL4-1-B-50	23	Pass	14	Pass	7	Pass	0	5	94.9	Pass
10/12/2000	Y	Pass	411.39	242.0	498.0	0								31.74	42.3	0											
10/13/2000	Y	Pass	455.12	267.7	765.8	0	L-OCF-TBL4-1-S-42	37.2	Pass	13.9	Pass	NP	NP	105.31	147.6	2	L-OCFTBL4-1-B-51	22.5	Pass	13.6	Pass	7	Pass	0	2.2	97.8	Pass
10/14/2000	Y	Pass	647.5	380.9	1146.6	1	L-OCF-TBL4-1-S-43	40.7	Pass	8.8	Pass	NP	NP	115.09	162.7	3	L-OCFTBL4-1-B-52	21	Pass	14	Pass	9	Pass	0	3	97	Pass
10/15/2000	N	-	0	0.0	146.6	0								0.00	12.7	0											
10/16/2000	Y	Pass	380.2	223.6	370.3	0								34.81	47.5	0											
10/17/2000	Y	Pass	61.51	36.2	406.5	0								0.00	47.5	0											
10/18/2000	N	-	0	0.0	406.5	0								33.97	81.5	1											
10/19/2000	N	-	0	0.0	406.5	0								0.00	31.5	0											
10/20/2000	N	-	0	0.0	406.5	0								0.00	31.5	0											
10/21/2000	N	-	0	0.0	406.5	0								0.00	31.5	0											
10/22/2000	N	-	0	0.0	406.5	0								0.00	31.5	0											
10/23/2000	Y	Pass	431.94	254.1	660.6	0								0.00	31.5	0											
10/24/2000	Y	Pass	716.04	421.2	1081.8	1	L-OCF-TBL4-1-S-44	35.3	Pass	11.5	Pass	NP	NP	98.59	130.0	2	L-OCFTBL4-1-B-53	22	Pass	13.8	Pass	7	Pass	0	2.2	97.8	Pass
							L-OCF-TBL4-1-S-45	28.6	Fail	24.1	Fail	NP	NP				L-OCFTBL4-1-B-54	23.5	Pass	13.4	Pass	8	Pass	0	3.4	96.6	Pass
																	L-OCFTBL4-1-B-55	22	Pass	13.6	Pass	8	Pass	0	2.9	97.1	Pass
																	L-OCFTBL4-1-B-56	22	Pass	9.2	Pass	7	Pass	0	3	97	Pass
10/25/2000	Y	Pass	616.64	362.7	444.5	0	L-OCF-TBL4-1-S-46	32.4	Fail	17.3	Fail	NP	NP	106.57	136.6	2	L-OCFTBL4-1-B-57	21.5	Pass	9.2	Pass	8	Pass	0	4.7	95.3	Pass
																	L-OCFTBL4-1-B-58	7	Fail (outlier)	separated [3]	Fail (outlier)	3	Pass	0	1.9	98.1	Pass
10/26/2000	Y	Pass	669.45	393.8	838.3	0	L-OCF-TBL4-1-S-47	31	Fail	18	Fail	NP	NP	0.00	36.6	0											
10/27/2000	Y	Pass	883.6	519.8	1358.0	1	L-OCF-TBL4-1-S-48	33	Fail	19	Fail	NP	NP	29.44	66.1	1											
10/28/2000	N	-	0	0.0	358.0	0								0.00	16.1	0											
10/29/2000	N	-	0	0.0	358.0	0								0.00	16.1	0											
10/30/2000	Y	Pass	680.54	400.3	758.4	0								111.73	127.8	2											
10/31/2000	Y	Pass	655.13	385.4	1143.7	1								138.39	166.2	3	L-OCFTBL4-1-B-59	24	Pass	13.6	Pass	8	Pass	0	4	96	Pass
																	L-OCFTBL4-1-B-60	22.5	Pass	15	Pass	6	Pass	0	4.4	95.6	Pass
																	L-OCFTBL4-1-B-61	22	Pass	15.4	Fail (outlier)	6	Pass	0	5.7	94.3	Pass
11/1/2000	Y	Pass	774.49	455.6	599.3	0	L-OCF-TBL4-1-S-49	34.7	Fail	19.2	Fail	NP	NP	0.00	16.2	0	L-OCFTBL4-1-B-62	26	Pass	43.6	Fail (outlier)	7	Pass	0	5.2	94.8	Pass
																	L-OCFTBL4-1-B-63	20	Fail (outlier)	15.2	Fail (outlier)	6	Pass	0	4	96	Pass
																	L-OCFTBL4-1-B-64	21	Pass	14.4	Pass	8	Pass	0	3.7	96.3	Pass
11/2/2000	N	-	0	0.0	599.3	0								0.00	16.2	0											
11/3/2000	N	-	0	0.0	599.3	0								0.00	16.2	0											
11/4/2000	N	-	0	0.0	599.3	0								0.00	16.2	0											

***Note 1:** Tests performed consistent with ASTM D 5890.* Rejection criteria is no more than 5% of samples outside of limits established by Project Specifications (≥ 24 ml/2g) or test pad program (≥ 21 ml/2g). The Project Specifications for free swell was established based on tests performed using ACC 1010.

Note 2: Result on left obtained using ASTM D5890. Result on right obtained using ACC 1010.

Note 3: The contractor noted that a new driver was working this day and he obtained the sample from the bottom of the truck (cleanout port) rather than from the top of the truck (access port). The contractor further explained that the trucks also haul other commodities that are non-hazardous such as grain, lime, fly ash, Portland cement, etc. Therefore, it is highly likely that this sample contained some material that had accumulated in the cleanout port from a previous load. Additionally, it is noted *that sample B-57 was collected from the same rail car as B-58.* However, B-57 was collected from the access port similar to all other samples which represents the bentonite.

OCF Table 4-1. Testing of Soil and Bentonite Prior to Mixing

	Soil - Field		Soil - Lab																Bentonite - Lab											Grain Size Distribution			
Date	Visual Inspection for Soil Content (Y/N)	Pass/ Fail	Tons Delivered	Running Total	Required Sample (1 per 1500 tons)	Contractor Sample	Percent Fines at Borrow Source	Pass/Fail (<5% out of 25-45% range)	Percent Gravel at Borrow Source	Pass/Fail (<5% >1 inch minus)	Engineer Inspector Sample No.	Percent Fines	Pass/Fail (<5% out of 25-45% range)	Percent Gravel	Pass/Fail (<5% >1 inch minus)	Liquid Limit	Plastic Limit	Plastic Index	Owner Certification on acceptable gradation and type (yes/no)	Tons Delivered	Running Total of 50 tons	Required Sample (1 per 50 tons)	Sample No.	Free Swell (ml/2 g)	Pass/ Fail (<5% ≥21 ml/2g)	Filtrate Loss (ml)	Pass/ Fail (<5% ≤ 15 ml)	Moisture Content (%)	Pass/ Fail (<5% ≤ 10%)	Percent Gravel	Percent Sand	Percent Fines	Pass/ Fail (>70%)
5/19/2001																			BN422511 - yes														
																			BN458657 - yes														
5/22/2001																			BN422588 - yes														
																			BN458305 - yes														
5/29/2001																			BN458489 - yes														
																			BN446284 - yes														
																			BN455369 - yes														
5/30/2001																			BN455486 - yes														
6/1/2001						1	32.2	Pass	100%<3/4"	Pass																							
6/5/2001	Yes	Pass	629	629	0						TBL4-1-S-50	33	Pass	100%<3/8"	Pass	NA	NA	NP		102	102	2	TBL4-1-B-65	22	Pass	14.2	Pass	9	Pass	0	3	97	Pass
											TBL4-1-S-51	40	Pass	100%<3/8"	Pass	17	18	NP					TBL4-1-B-66	22	Pass	13.8	Pass	8	Pass	0	2	98	Pass
6/6/2001	Yes	Pass	847	1476	0															99	101	2	TBL4-1-B-67	24	Pass	15.0	Pass	8	Pass	0	2	98	Pass
																							TBL4-1-B-68	24	Pass	15.0	Pass	8	Pass	0	2	98	Pass
6/7/2001	Yes	Pass	895	2370	1	2	37.5	Pass	100%<3/4"	Pass	TBL4-1-S-52	41	Pass	100%<3/8"	Pass	NA	NA	NP		99	100	2	TBL4-1-B-69	20	Fail (outlier)	14.4	Pass	9	Pass	0	2	98	Pass
																							TBL4-1-B-70	26	Pass	15.6	Fail (outlier)[1]	8	Pass	0	3	97	Pass
6/8/2001	Yes	Pass	697	1567	1						TBL4-1-S-53	39	Pass	100%<3/4"	Pass	NA	NA	NP		33	33	0	TBL4-1-B-71	24	Pass	14.0	Pass	8	Pass	0	3	97	Pass
6/9/2001	Yes	Pass	1117	1184	0															103	136	2	TBL4-1-B-72	22	Pass	14.4	Pass	8	Pass	0	3	97	Pass
																							TBL4-1-B-73	24	Pass	14.4	Pass	10	Pass	0	4	96	Pass
																							TBL4-1-B-74	22	Pass	14.4	Pass	9	Pass	0	3	97	Pass
6/12/2001																			BN453369 - yes														
																			BN422640 - yes														
6/13/2001	Yes	Pass	539	1723	1														BN422652 - yes	34	70	1											
6/14/2001	Yes	Pass	1091	1314	0	3	35.8	Pass	100%<3/4"	Pass									BN421097 - yes	96	116	2	TBL4-1-B-75	24	Pass	16.4	Fail (outlier)[1]	8	Pass	0	1	99	Pass
																							TBL4-1-B-76	22	Pass	15.6	Fail (outlier)[1]	7	Pass	0	2	98	Pass
																							TBL4-1-B-77	22	Pass	15.6	Fail (outlier)[1]	7	Pass	0	2	98	Pass
6/15/2001	Yes	Pass	851	2165	1						TBL4-1-S-54	42	Pass	100%<3/4"	Pass	NA	NA	NP		36	52	1											
6/16/2001																				100	102	2	TBL4-1-B-78	22	Pass	14.8	Pass	10	Pass	0	3	97	Pass
																							TBL4-1-B-79	26	Pass	14.4	Pass	10	Pass	0	3	97	Pass
6/18/2001	Yes	Pass	1226	1891	1														BN453372 - yes	99	101	2	TBL4-1-B-80	24	Pass	14.4	Pass	10	Pass	0	3	97	Pass
																			BN446060 - yes				TBL4-1-B-81	22	Pass	14.2	Pass	10	Pass	0	3	97	Pass
6/19/2001	Yes	Pass	878	1269	0	4	33.2	Pass	100%<3/4"	Pass	TBL4-1-S-55	34	Pass	100%<3/4"	Pass	NA	16	NP		100	101	2	TBL4-1-B-82	26	Pass	13.8	Pass	8	Pass	0	2	98	Pass
																							TBL4-1-B-83	26	Pass	14	Pass	9	Pass	0	2	98	Pass
																							TBL4-1-B-84	28	Pass	14.8	Pass	8	Pass	0	3	97	Pass
																							TBL4-1-B-85	26	Pass	14.4	Pass	8	Pass	0	2	98	Pass
6/20/2001	Yes	Pass	855	2124	1	5	35.1	Pass	100%<3/4"	Pass										107	108	2	TBL4-1-B-86	22	Pass	13	Pass	11	Fail (outlier)	0	3	97	Pass
																							TBL4-1-B-87	24	Pass	13.8	Pass	10	Pass	0	3	97	Pass
																							TBL4-1-B-88	24	Pass	13.8	Pass	10	Pass	0	3	97	Pass
																							TBL4-1-B-89	24	Pass	14.0	Pass	10	Pass	0	3	97	Pass
6/21/2001	Yes	Pass	898	1522	1	6	32.6	Pass	100%<3/4"	Pass	TBL4-1-S-56	31	Pass	100%<3/4"	Pass	NA	NA	NP		69	77	1											
6/22/2001	Yes	Pass	1005	1027	0	7	33.9	Pass	100%<3/4"	Pass										67	94	1											
6/25/2001	Yes	Pass	933	1960	1															63	107	2	TBL4-1-B-90	28	Pass	14.4	Pass	6	Pass	0	2	98	Pass
																							TBL4-1-B-91	26	Pass	14.8	Pass	7	Pass	0	2	98	Pass
																							TBL4-1-B-92	24	Pass	14.8	Pass	6	Pass	0	2	98	Pass
																							TBL4-1-B-93	24	Pass	14.8	Pass	8	Pass	0	2	98	Pass
6/26/2001	Yes	Pass	781	1241	0														BN422392 - yes	102	109	2											
6/29/2001	Yes	Pass	683	1924	1	8	28	Pass	100%<3/4"	Pass	TBL4-1-S-57	27	Pass	100%<3/4"	Pass	NA	NA	NP		66	75	1											
7/2/2001	Yes	Pass	707	1131	0	9	36.7	Pass	100%<3/4"	Pass									BN453816 - yes	34	59	1											
7/3/2001	Yes	Pass	624	1755	1						TBL4-1-S-58	41	Pass	100%<3/4"	Pass	NA	NA	NP	BN422570 - yes														
7/5/2001	Yes	Pass	892	1147	0	10	36.3	Pass	100%<3/4"	Pass	TBL4-1-S-59	34.8	Pass	100%<3/4"	Pass	NA	NA	NP															
7/6/2001	Yes	Pass	675	1822	1																												
7/9/2001	Yes	Pass	92	414	0																		TBL4-1-B-94	30	Pass	15.2	Fail (outlier)[1]	8	Pass	0	5	95	Pass
																							TBL4-1-B-95	28	Pass	14.4	Pass	8	Pass	0	4	96	Pass
																							TBL4-1-B-96	26	Pass	14	Pass	9	Pass	0	4	96	Pass
																							TBL4-1-B-97	28	Pass	14	Pass	8	Pass	0	4	96	Pass
7/10/2001	Yes	Pass	63	477	0	11	39.6	Pass	100%<3/4"	Pass										134	143	2											
7/11/2001	Yes	Pass	418	895	0	12	36.6	Pass	100%<3/4"	Pass										67	110	2	TBL4-1-B-98	26	Pass	13.2	Pass	9	Pass	0	5	95	Pass
																							TBL4-1-B-99	24	Pass	13.6	Pass	9	Pass	0	4	96	Pass
																							TBL4-1-B-100	28	Pass	12.4	Pass	8	Pass	0	4	96	Pass
																							TBL4-1-B-101	28	Pass	13.4	Pass	8	Pass	0	4	96	Pass
7/12/2001	Yes	Pass	575	1470	0						TBL4-1-S-60[2]	-	-	-	-	-	-	-		104	114	2											
7/13/2001	Yes	Pass	1056	2526	1	13	31.6	Pass	100%<3/4"	Pass										72	86	1											

OCF Table 4-1. Testing of Soil and Bentonite Prior to Mixing

	Soil - Field		Soil - Lab																Bentonite - Lab														
																														Grain Size Distribution			
Date	Visual Inspection for Soil Content (Y/N)	Pass/ Fail	Tons Delivered	Running Total	Required Sample (1 per 1500 tons)	Contractor Sample	Percent Fines at Borrow Source	Pass/Fail (<5% out of 25-45% range)	Percent Gravel at Borrow Source	Pass/Fail (<5% >1 inch minus)	Engineer Inspector Sample No.	Percent Fines	Pass/Fail (<5% out of 25-45% range)	Percent Gravel	Pass/Fail (<5% >1 inch minus)	Liquid Limit	Plastic Limit	Plastic Index	Owner Certification on acceptable gradation and type (yes/no)	Tons Delivered	Running Total of 50 tons	Required Sample (1 per 50 tons)	Sample No.	Free Swell (ml/2 g)	Pass/ Fail (<5% ≥21 ml/2g)	Filtrate Loss (ml)	Pass/ Fail (<5% ≤ 15 ml)	Moisture Content (%)	Pass/ Fail (<5% ≤ 10%)	Percent Gravel	Percent Sand	Percent Fines	Pass/ Fail (>70%)
7/16/2001	Yes	Pass	815	1841	1						TBL4-1-S-61	8.2	Fail[3]	100%<3/8"	Pass	NA	NA	NP		33	69	1											
7/17/2001	Yes	Pass	92	433	0	14	33.6	Pass	100%<3/4"	Pass	TBL4-1-S-62	10.1	Fail[3]	100%<3/8"	Pass	NA	NA	NP															
											Note 2: Sample was tested incorrectly and consumed.		Note 3: The last 2,000 to 3,000 tons of import was not used in the pugging process and is stockpiled for other future uses.													Note 1: The filtrate loss test was discussed with EPA and it was determined that this test is not necessarily applicable to the OCF liner performance.							

OCF Table 4-2. Pre-Construction Evaluation Import Liner Material

	Borrow						*Borrow and Bentonite*														
	Grain Size Distribution						Grain Size Distribution									Standard Compaction			Modified Compaction		
Sample No.	Percent Gravel	Pass/Fail (<15%)	Percent Sand	Pass/Fail (NA)	Percent Fines	Pass/Fail (35 - 45%)	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Pass/ Fail (<35 Fail)	Plastic Index	Pass/ Fail (<15 Fail)	Specific Gravity	Max dry (pcf)	Opt Moist %	Initial Moist %	Max dry (pcf)	Opt Moist %	Initial Moist %
L-OCF-LP-Base-1000-1	9.5	Pass	50.9	-	39.5	Pass	12.6	45.5	41.9	56	Pass	41	Pass	2.677	125.4	10.8	7	132.7	7.9	7

Remolded									Effective Shear Strength Triaxial Compression		
Test No	Moisture Content (%)	Dry Density (pcf)	Hydraulic Conductivity at 2.5 PSI (cm/sec)	Pass/ Fail (<7.5x10^{-8} cm/sec)	Hydraulic Conductivity at 5 PSI (cm/sec)	Pass/ Fail (<7.5x10^{-8} cm/sec)	Hydraulic Conductivity at 10 PSI (cm/sec)	Pass/ Fail (<7.5x10^{-8} cm/sec)	Effective Cohesion (ksf)	Effective Friction Angle (degrees)	Pass/Fail (frictional angle >22 degrees)
1	10.8	125.8	1.1x10^{-8}	Pass	1.2x10^{-8}	Pass	9.6x10^{-9}	Pass	Result determined after 3 tests	Result determined after 3 tests	-
2	10.8	119.3	1.4x10^{-8}	Pass	2.4x10^{-8}	Pass	1.7x10^{-8}	Pass	Result determined after 3 tests	Result determined after 3 tests	-
3	13.3	119.5	not tested	-	1.9x10^{-8}	Pass	1.7x10^{-8}	Pass	Result determined after 3 tests	Result determined after 3 tests	-
									1.1	12.3	Fail (accepted)[1]

Note: (1) - Analysis showed that combination of cohesion and friction angle provides a factor of safety much greater than 1.5

OCF Table 4-2. Pre-Construction Evaluation Import Liner Material

Sample No.	Borrow: Grain Size Distribution: Percent Gravel	Pass/Fail (<15%)	Percent Sand	Pass/Fail (NA)	Percent Fines	Pass/Fail (35 - 45%)	Borrow and Bentonite: Grain Size Distribution: Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Pass/ Fail (<35 Fail)	Plastic Index	Pass/ Fail (<15 Fail)	Specific Gravity	Standard Compaction: Max dry (pcf)	Opt Moist %	Initial Moist %	Modified Compaction: Max dry (pcf)	Opt Moist %	Initial Moist %
L-OCF-LP-Base-1000-1	9.5	Pass	50.9	-	39.5	Pass	12.6	45.5	41.9	56	Pass	41	Pass	2.677	125.4	10.8	7	132.7	7.9	7

Sample No.	Remolded: Test No	Moisture Content (%)	Dry Density (pcf)	Hydraulic Conductivity at 2.5 PSI (cm/sec)	Pass/ Fail (<7.5x10^{-8} cm/sec)	Hydraulic Conductivity at 5 PSI (cm/sec)	Pass/ Fail (<7.5x10^{-8} cm/sec)	Hydraulic Conductivity at 10 PSI (cm/sec)	Pass/ Fail (<7.5x10^{-8} cm/sec)	Effective Shear Strength Triaxial Compression: Effective Cohesion (ksf)	Effective Friction Angle (degrees)	Pass/Fail (frictional angle >22 degrees)
L-OCF-LP-Base-1000-1	1	10.8	125.8	1.1x10^{-8}	Pass	1.2x10^{-8}	Pass	9.6x10^{-9}	Pass	Result determined after 3 tests	Result determined after 3 tests	-
	2	10.8	119.3	1.4x10^{-8}	Pass	2.4x10^{-8}	Pass	1.7x10^{-8}	Pass	Result determined after 3 tests	Result determined after 3 tests	-
	3	13.3	119.5	not tested	-	1.9x10^{-9}	Pass	1.7x10^{-8}	Pass	Result determined after 3 tests	Result determined after 3 tests	-
										1.1	12.3	Fail (accepted)[1]

Note: (1) - Analysis showed that combination of cohesion and friction angle provides a factor of safety much greater than 1.5

OCF Table 4-3. Construction Test Section

Field Tests

Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Percent Water Content - Nuclear (5 per Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.3 to 14.3 % and no below 8.3%)	Percent Compaction - Nuclear (5 per Lift)	Pass/Fail (>94%)	Dry Density - Nuclear (pcf) (5 per Lift)	Pass/Fail (<3% with no <5 pcf of Value identified as 122.2 pcf (117.2 pcf)	Wet Density - Nuclear (pcf)
8/15/2000												
8/16/2000												
8/17/2000	1 - South	1	104	75		13.2	Pass	95.7	Pass	123.1	Pass	139.4
	1 - South	1	105	50		12.7	Pass	95.5	Pass	122.8	Pass	138.4
	2 - South	1	106	50 (note: at 4" depth not 6")	107	14.7	Fail (retested)	91.4	Fail (retested)	117.6	Fail (retested)	134.9
	2 - South	1	107	50 (note: at 4" depth not 6")		13.5	Pass	92.9	Fail (outlier)	119.6	Fail (outlier)	135.8
	2 - South	1	108	60	108A	13.6	Pass	93.6	Fail (retested)	120.4	Fail (retested)	136.8
8/18/2000	1 - South	1	108	75		11.5	Pass	97.6	Pass	125.5	Pass	139.9
	1 - South	1	109	60		12.9	Pass	96.5	Pass	124.1	Pass	140.1
	1 - South	1	110	75 (note: at 8" depth not 6")		11.7	Pass	99.2	Pass	127.7	Pass	142.7
	1 - South	1	111	60 (note: at 8" depth not 6")		12.8	Pass	95.5	Pass	122.8	Pass	138.3
	1 - South	1	112	40		13.3	Pass	94.9	Pass	122.1	Pass	138.4
	1 - South	1	113	30		13	Pass	96.8	Pass	124.5	Pass	140.7
	1 - South	1	114	20		11.9	Pass	97.5	Pass	125.4	Pass	140.3
	1 - South	1	115	18		13.8	Pass	95.9	Pass	123.4	Pass	140.4
8/21/2000	2-North	1	108	75		13.5	Pass	98.6	Pass	124.3	Pass	141.1
	2-North	1	110	70		13.2	Pass	96.7	Pass	124.4	Pass	140.8
	2-North	1	111	60		12.8	Pass	98.2	Pass	126.4	Pass	142.6
	2-North	1	112	60		12.4	Pass	98.9	Pass	127.2	Pass	143
	2-North	1	113	45		13.58	Pass	97.11	Pass	124.9	Pass	141.9
	2-North	1	114	25		12.73	Pass	98.29	Pass	126.4	Pass	142.5
	2-South	1	108A	60		12.73	Pass	98.93	Pass	127.5	Pass	143.7
	2-South	1	116	30		13.69	Pass	96.2	Pass	124	Pass	140.9
8/22/2000	1-South	2	117	75		13	Pass	95.17	Pass	122.8	Pass	138.8
	1-South	2	118	65		12.87	Pass	95	Pass	122.4	Pass	138.3
	1-South	2	119	50		12.87	Pass	97.15	Pass	125.2	Pass	141.4
	1-South	2	120	30		11.85	Pass	99.24	Pass	127.9	Pass	143.2
	2 - South	2	121	65		13.09	Pass	95.62	Pass	123.2	Pass	139.3
	2-South	2	122	53		11.77	Pass	98.21	Pass	124	Pass	138.8
	2-South	2	123	35		12.35	Pass	95.65	Pass	123.2	Pass	139.5
	2-North	2	124	25		12.34	Pass	97.29	Pass	125.4	Pass	140.8
	1-South	2	125	75		12.88	Pass	95.78	Pass	123.4	Pass	139.3
	2-South	3	126	67	126A	12.79	Pass	94.53	Pass	121.6	Fail (retested)	137.4
	2-South	3	127	58		11.7	Pass	95.61	Pass	123.5	Pass	137.9
	2-South	3	128	28	128A	12.01	Pass	93.75	Fail (retested)	120.8	Fail (retested)	135.3
	2-North	3	129	75		12.35	Pass	95.98	Pass	123.7	Pass	138.9
8/23/2000	2-South	3	126A	67		12.1	Pass	97.2	Pass	125.2	Pass	140.3
	2-South	3	127A	58		11.79	Pass	99.2	Pass	127.8	Pass	142.8
	2-South	3	128A	28		11.94	Pass	96.1	Pass	123.9	Pass	138.6
	2-North	3	129A	75		12.17	Pass	97.3	Pass	125.3	Pass	140.8
	1-South	3	130	75		11.96	Pass	97.3	Pass	125.4	Pass	140.4
	1-South	3	131	63		11.48	Pass	97.5	Pass	125.8	Pass	140.1
	1-South	3	132	43		12.04	Pass	95.77	Pass	123.4	Pass	138.3
	1-South	3	133	34		12.77	Pass	94.1	Pass	121.3	Fail (outlier)	136.8
	1-South	3	134	34		11.79	Pass	96.43	Pass	124.2	Pass	138.8
	1-South	3	135	34		11.84	Pass	95.91	Pass	123.6	Pass	138.2
	2-South	4	136	74		11.68	Pass	98.1	Pass	126.4	Pass	141.2
	2-South	4	137	60		11.83	Pass	96.64	Pass	124.5	Pass	139.3
	2-North	4	138	38		12.04	Pass	95.15	Pass	122.6	Pass	137.4
	2-North	4	139	30		12.81	Pass	96.36	Pass	124.2	Pass	139.8
8/24/2000	1-South	4	142	75		12	Pass	97.3	Pass	125.3	Pass	140.4
	1-South	4	143	63		11.81	Pass	95.35	Pass	122.9	Pass	137.5
	1-South	4	144	42		11.3	Pass	97.9	Pass	128.2	Pass	140.4
	1-South	4	145	32	145A	10.6	Fail (retested)	98.24	Pass	126.6	Pass	140
8/25/2000	2-South	5	150	78	150A-1 and 150A-2	10.87	Fail (retested)	96.5	Pass	124.3	Pass	137.9
	2-South	5	150A-1	78		10.95	Fail (outlier)	98.36	Pass	126.7	Pass	140.6
	2-South	5	150A-2	78		11.8	Pass	97	Pass	125	Pass	139.8
	2-South	5	151	58	151A-1 and 151A-2	11.09	Fail (retested)	93.61	Fail (retested)	120.6	Fail (retested)	134
	2-South	5	151A-1	58		12.33	Pass	96.34	Pass	124.1	Pass	139.4
	2-South	5	151A-2	58		12.17	Pass	96.24	Pass	124	Pass	139.1
	2-South	5	152	43		12.92	Pass	96.5	Pass	124.3	Pass	140.4
	2-South	5	153	25		12.01	Pass	95.35	Pass	122.9	Pass	137.6
	1-South	4	144A	42		11.73	Pass	97.1	Pass	125.1	Pass	139.8

Lab Tests

Date	Nuclear Test No.	Sample No.	Particle Size: Percent Gravel	Pass/Fail (<15%)	Percent Sand	Pass/Fail (NA)	Percent Fines	Pass/Fail (35-65%)	Liquid Limit	Pass/Fail (<35 Fail)	Plastic Index	Pass/Fail (<15 Fail)	Standard Compaction: Max dry (pcf)	Opt Moist %	Initial Moist %	Modified Compaction: Max dry (pcf)	Opt Moist %	Initial Moist %	Specific Gravity	Water Content Percent - Oven
8/15/2000		L-OCF-TBL4-3-S-8 (note: collected from stockpile designated for lifts 1 and 2)	20.8	Fail	39.8	-	39.4	Pass	47	Pass	34	Pass	128.5	10.8	13	138.2	7.8	13	2.657	13
8/17/2000	104	L-OCF-TBL4-3-S-9 (note: collected from stockpile designated for lifts 3 and 4)	17.8	Fail	44.8	-	37.4	Pass	46	Pass	34	Pass	128.2	11	13	137	7.8	13	2.654	13

Date	Nuclear Test No.	Additional Samples Collected for Water Content Percent - Oven (to directly compare to Nuclear)	Water Content Percent - Oven	Percent Difference in Oven and Nuclear Water Content	Samples Collected for Density - Sand Cone (1 per 2 lifts)	Dry Density Sand Cone (pcf)	Difference in Sand Cone and Nuclear Dry Density (pcf)	Wet Density - Sand Cone (pcf)	Difference in Sand Cone and Nuclear Wet Density (pcf)
8/22/2000	125	L-OCF-TBL4-3-WC-14	11.3	-1.58	L-OCF-TBL4-3-SC-5	123	-0.4	136.9	-2.4
8/23/2000	135	L-OCF-TBL4-3-WC-15	11.1	-0.74					
8/23/2000	138	L-OCF-TBL4-3-WC-16	10.5	-1.33	L-OCF-TBL4-3-SC-6	125.3	+0.8	138.5	-0.8
8/24/2000	144	L-OCF-TBL4-3-WC-17	10.8	-0.5					
8/24/2000	145	L-OCF-TBL4-3-WC-18	10.3	-0.3					
8/25/2000	150A-2	L-OCF-TBL4-3-WC-19	10.4	-1.4					

Date	Nuclear Test No.	Lift No. for Shelby Tubes	Location (Panel and Direction)	Tube No. (4 Shelby Tubes per lift)	Sample No.	Hydraulic Conductivity at 5 PSI (cm/sec)	Pass/Fail (<1x10^{-7} cm/sec)	Moisture Content (%)	Dry Density (pcf)
8/18/2000	108	1	1 - South	1	L-OCF-TBL4-3-HC-29	1.0×10^{-8}	Pass	12	126.6
8/18/2000	111	1	1 - South	2	L-OCF-TBL4-3-HC-30	2.0×10^{-8}	Pass	10	130.9
8/18/2000	112	1	1 - South	3	L-OCF-TBL4-3-HC-31	8.0×10^{-8}	Pass	10	129.2
8/18/2000	114	1	1 - South	4	L-OCF-TBL4-3-HC-32	2.0×10^{-8}	Pass	12	123.2
8/21/2000	116	1	2 - South	5	L-OCF-TBL4-3-HC-33	2.0×10^{-8}	Pass	13	123.9
8/22/2000	117	2	1 - South	1	L-OCF-TBL4-3-HC-34	1.0×10^{-8}	Pass	11	129.7
8/22/2000	120	2	1 - South	2	L-OCF-TBL4-3-HC-35	1.0×10^{-8}	Pass	11	131.3
8/22/2000	122	2	2 - South	3	L-OCF-TBL4-3-HC-36	2.0×10^{-8}	Pass	12	127.7
8/22/2000	123	2	2 - South	4	L-OCF-TBL4-3-HC-37	2.0×10^{-8}	Pass	12	124.1
8/22/2000	128	3	2 - South	1	L-OCF-TBL4-3-HC-38	1.0×10^{-8}	Pass	12	123.2
8/22/2000	129	3	2 - North	2	L-OCF-TBL4-3-HC-39	3.0×10^{-8}	Pass	12	128.8
8/23/2000	131	3	1 - South	3	L-OCF-TBL4-3-HC-40	1.0×10^{-8}	Pass	11	128.8
8/23/2000	133	3	1 - South	4	L-OCF-TBL4-3-HC-41	5.3×10^{-8}	Pass	11.5	126.8
8/23/2000	137	4	2 - South	1	L-OCF-TBL4-3-HC-42	1.2×10^{-8}	Pass	11.3	125.9
8/23/2000	138	4	2 - North	2	L-OCF-TBL4-3-HC-43	7.8×10^{-8}	Pass	10.8	125.7
8/24/2000	143	4	1 - South	3	L-OCF-TBL4-3-HC-44	2.3×10^{-8}	Pass	11.8	122.7
8/25/2000	150A-2	5	2 - South	1	L-OCF-TBL4-3-HC-47	7.7×10^{-8}	Pass	10.8	127.1
8/25/2000	151	5	2 - South	2	L-OCF-TBL4-3-HC-48	2.6×10^{-8}	Pass	11.5	130.8
8/25/2000	144A	4	1 - South	4	L-OCF-TBL4-3-HC-45	1.3×10^{-8}	Pass	10.8	127.8

OCF Table 4-3. Construction Test Section

Field Tests													Lab Tests																																		
														Particle Size										Standard Compaction			Modified Compaction																				
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Percent Water Content - Nuclear (5 per Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.3 to 14.3 % and no below 9.3%)	Percent Compaction - Nuclear (5 per Lift)	Pass/Fail (>94%)	Dry Density - Nuclear (pcf) (5 per Lift)	Pass/Fail (<3% with no <5 pcf of Value identified as 122.2 pcf (117.2 pcf)	Wet Density - Nuclear (pcf)	Sample No.	Percent Gravel	Pass/ Fail (<15%)	Percent Sand	Pass/ Fail (NA)	Percent Fines	Pass/ Fail (35 - 45%)	Liquid Limit	Pass/ Fail (<35 Fail)	Plastic Index	Pass/ Fail (<15 Fail)	Max dry (pcf)	Opt Moist %	Initial Moist %	Max dry (pcf)	Opt Moist %	Initial Moist %	Specific Gravity	Water Content Percent - Oven	Additional Samples Collected for Water Content Percent - Oven (to directly compare to Nuclear)	Water Content Percent - Oven	Percent Difference in Oven and Nuclear Water Content	Samples Collected for Density - Sand Cone (1 per 2 lifts)	Dry Density Sand Cone (pcf)	Difference in Sand Cone and Nuclear Dry Density (pcf)	Wet Density- Sand Cone (pcf)	Difference in Sand Cone and Nuclear Wet Density (pcf)	Lift No. for Shelby Tubes	Location (Panel and Direction)	Tube No. (4 Shelby Tubes per lift)	Sample No.	Hydraulic Conductivity at 5 PSI (cm/sec)	Pass/ Fail (<1x10^{7} cm/sec)	Moisture Content (%)	Dry Density (pcf)
	1-South	4	145A	32		11.84	Pass	98.4	Pass	124.2	Pass	139.1																												4	1 - South	5	L-OCF-TBL4-3-HC-48	3.5x10^{9}	Pass	12	127.7
8/21/2000	1 - South	5	307	20		12.7	Pass	97	Pass	124.7	Pass	140.6	L-OCF-TBL4-3-S-10 (note: collected from stockpile designated for final lifts)	18.8	Fail	42.4	-	38.9	Pass	50	Pass	37	Pass	130.7	10	12	139	7	12	2.637	12																
	1 - South	5	308	35		12.7	Pass	95.7	Pass	123.1	Pass	138.8																																			
	2 - North	6	309	35		13	Pass	98.3	Pass	123.8	Pass	139.9																																			
	1 - South	6	310	25		11.7	Pass	98.2	Pass	123.7	Pass	138.2																																			
	2 - South	final	311	20		12.1	Pass	97.5	Pass	125.5	Pass	140.7																												final	2 - South	1	L-OCF-TBL4-3-HC-49	1.9x10^{9}	Pass	11.8	118.1
	2 - North	final	312	25		11.4	Pass	97.9	Pass	126	Pass	140.4																																			
	1 - South	final	313	30		11.8	Pass	97.5	Pass	125.4	Pass	140.2																												final	1 - South	2	L-OCF-TBL4-3-HC-50	1.8x10^{9}	Pass	11	123.1
	2 - North	final	314	45		11.6	Pass	98.2	Pass	126.4	Pass	141																																			
	1 - South	final	315	55		11.9	Pass	96.8	Pass	124.8	Pass	139.4																												final	1 - South	3	L-OCF-TBL4-3-HC-51	1.3x10^{9}	Pass	10.9	121.3
	2 - North	final	316	65		11.3	Pass	98.7	Pass	127	Pass	141.3																																			
	2 - South	final	317	75		12	Pass	97.7	Pass	125.8	Pass	140.8																				L-OCF-TBL4-3-WC-20	10.7	-1.3	L-OCF-TBL4-3-SC-7	121.8	-4	134.8	-6.1	final	2 - South	4	L-OCF-TBL4-3-HC-52	2.5x10^{9}	Pass	12.1	128.3
	1 - South	final	318	80		11.9	Pass	97.3	Pass	125.2	Pass	140.1																																			
8/22/2000	2 - South	final	324	35		11.4	Pass	98.1	Pass	123.6	Pass	137.7																																			

OCF Table 4-4. Testing of Soil and Bentonite Prior to Compaction

Date	Percent Bentonite (see Contractor's summary for daily mixing information)	Visual Inspection of Mixed Material (Y/N)	Pass/ Fail	Comments	Location (Panel and Direction)	Scarification (Y/N)	Pass/ Fail (<6")	Explanation for no Scarification	Action Taken for Fail	Stakes Inventoried (Y/N)	No. of Stakes in Working Area at Beginning of Day	No. of Stakes in Working Area at End of Day	All Stakes Accounted (Y/N)	Explanation For Difference	Total CY Placed	Running Total of 5000 CY	Required Sample (1 per 5000 CY)	Sample No.	Standard Compaction: Max dry (pcf)	Standard Compaction: Opt Moist %	Standard Compaction: Initial Moist %	Liquid Limit	Plastic Limit	Plasticity Index
	Soil / Bentonite - Field														Soil / Bentonite - Lab									
8/24/2000	-	Y	Pass	-	20 - South and 20 - North	Y	Pass	-	-	N	-	-	-	-	700	700	0	L-OCFTBL4-4-S-1	128.9	10.8	11	45	13	32
8/25/2000	-	Y	Pass	-	20 - North	Y	Pass	-	-	N	-	-	-	-	500	1200	0							
8/26/2000	-	Y	Pass	-	19 - South and 20 - North	Y	Pass	-	-	N	-	-	-	-	500	1700	0							
8/27/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	1700	0							
8/28/2000	-	Y	Pass	-	20 - North and 19 - South	Y	Pass	-	-	N	-	-	-	-	600	2300	0							
8/29/2000	-	Y	Pass	-	19 - South, 20 - South, and 20 - North	Y	Pass	-	-	N	-	-	-	-	420	2720	0							
8/30/2000	-	Y	Pass	-	20 - North and 19 - South	Y	Pass	-	-	N	-	-	-	-	0	2720	0							
8/31/2000	-	Y	Pass	-	20 - South, 20 - North, and 19 - North (note 18 - South and North reworked)	Y	Pass	-	-	N	-	-	-	-	0	2720	0							
9/1/2000	-	Y	Pass	-	20 - North and 19 - North (note 18 - North was reworked)	Y	Pass	-	-	N	-	-	-	-	0	2720	0							
9/2/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2720	0							
9/3/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2720	0							
9/4/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2720	0							
9/5/2000	-	Y	Pass	-	18 - South, 18 - North, and 19 - South	Y	Pass	-	-	N	-	-	-	-	350	3070	0							
9/6/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	3070	0							
9/7/2000	-	Y	Pass	-	19 - South, 19 - North, 18 - South, and 18 - North	Y	Pass	-	-	N	-	-	-	-	450	3520	0							
9/8/2000	-	Y	Pass	-	18 - South, 18 - North, 19 - South, and 19 - North	Y	Pass	-	-	N	-	-	-	-	650	4170	0							
9/9/2000	-	Y	Pass	-	18 - South, 18 - North, 19 - South, and 19 - North	Y	Pass	-	-	N	-	-	-	-	300	4470	0	L-OCFTBL4-4-S-2	128.1	11.3	14	51	14	37
9/10/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	4470	0							
9/11/2000	-	Y	Pass	-	13 - North, 18 - South, 19 - South, 19 - North, and 20 - North	Y	Pass	-	-	N	-	-	-	-	450	4920	0							
9/12/2000	-	Y	Pass	-	13 - South, 13 - North, and 20 - North	Y	Pass	-	-	N	-	-	-	-	450	5370	1							
9/13/2000	-	Y	Pass	-	1 - North, 3 - North, 3 - South, 4 - South, 4 - North, 20 - North, and 20 South	Y	Pass	-	-	N	-	-	-	-	630	1000	0							
9/14/2000	-	Y	Pass	-	1 - North, 3 - North, 3 - South, 4 - South, 4 - North, 20 - North, and 20 South	Y	Pass	-	-	N	-	-	-	-	450	1450	0							
9/15/2000	-	Y	Pass	-	1 - North, 3 - North, 4 - South, and 4 - North	Y	Pass	-	-	Y	26	26	Y	-	400	1850	0							
9/16/2000	-	Y	Pass	-	1 - North, 3 - South, 3 - North, and 4 - North	Y	Pass	-	-	Y	26	26	Y	-	350	2200	0							
9/17/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2200	0							
9/18/2000	-	Y	Pass	-	1 - North, 3 - North, 4 - South, and 20 - South	Y	Pass	-	-	Y	25	24	Y	1 removed and collected	450	2650	0							
9/19/2000	-	Y	Pass	-	3 - South, 3 - North, 4, and 1 - North	Y	Pass	-	-	Y	57	57	Y	-	300	2950	0							
9/20/2000	-	Y	Pass	-	3 - North	Y	Pass	-	-	Y	57	57	Y	-	400	3350	0							
9/21/2000	-	Y	Pass	-	3 - South and 3 - North	Y	Pass	-	-	Y	57	57	Y	-	300	3650	0							
9/22/2000	-	Y	Pass	-	3 - South, 3 - North, 4 - South, and 4 - North	Y	Pass	-	-	Y	57	57	Y	-	630	4280	0							
9/23/2000	-	Y	Pass	-	4 - North (note panel 5 was reworked)	Y	Pass	-	-	Y	57	57	Y	-	800	5080	1							
9/24/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	80	0							
9/25/2000	-	Y	Pass	-	4 - South (note panels 5 and 6 were reworked)	Y	Pass	-	-	N	-	-	-	-	100	180	0	L-OCFTBL4-4-S-3	129.6	10.4	10	42	13	29
9/26/2000	-	Y	Pass	-	5	Y	Pass	-	-	Y	57	35	Y	12 removed and collected	0	180	0							
9/27/2000	-	Y	Pass	-	5, 6, and LCRS trench	Y	Pass	-	-	Y	35	23	Y	12 removed and collected	1160	1340	0							
9/28/2000	-	Y	Pass	small rock removed	6, 7, and LCRS trench	Y	Pass	-	-	Y	23	23	Y	-	1200	2540	0							
9/29/2000	-	Y	Pass	-	LCRS trench	Y	Pass	-	-	Y	23	23	Y	-	300	2840	0							
9/30/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2840	0							
10/1/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2840	0							
10/2/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2840	0							
10/3/2000	-	N	-	-	-	N	-	no work	-	-	-	-	-	-	0	2840	0							
10/4/2000	-	Y	Pass	-	6 and 7 - West	Y	Pass	-	-	Y	23	23	Y	-	200	3040	0							
10/5/2000	-	Y	Pass	small rock removed	5, 6, and 7 - West	Y	Pass	-	-	Y	23	21	Y	2 removed and collected	560	3600	0							
10/6/2000	-	Y	Pass	-	6, 7 - East, and 7 - West	Y	Pass	-	-	Y	21	21	Y	-	500	4100	0							
10/7/2000	-	N	-	-	*7 - East (continued work on material placed on 10/6/00)*	N	-	*only rolling performed*	-	N	-	-	-	-	0	4100	0							
10/8/2000	-	N	-	-	-	N	-	no work	-	N	-	-	-	-	0	4100	0							
10/9/2000	-	N	-	-	-	N	-	no work	-	N	-	-	-	-	0	4100	0							
########	-	N	-	-	-	N	-	no work	-	N	-	-	-	-	0	4100	0							
########	-	Y	Pass	-	7 - East	Y	Pass	-	-	Y	30	12	Y	18 removed and collected	350	4450	0							
########	-	Y	Pass	small rock removed	7 - East	Y	Pass	-	-	Y	20	0	Y	20 removed and collected	960	5410	1							
########	-	N	-	-	-	N	-	no work	-	N	-	-	-	-	0	410	0							
########	-	Y	Pass	-	8	Y	Pass	-	-	N	-	-	-	-	530	940	0							
########	-	N	-	-	-	N	-	no work	-	N	-	-	-	-	0	940	0							

OCF Table 4-4. Testing of Soil and Bentonite Prior to Compaction

Field Tests										*Lab Tests*								
Date	Percent Bentonite (see Contractor's summary for daily mixing information)	Visual Inspection of Mixed Material (Y/N)	Pass/ Fail	Comments	Daily Moisture Content of Mixed Material	Location of Material Placement (panel and lift)	Scarification (Y/N)	Stakes Accounted For (Y/N)	Explanation if not accounted for	Approximate Total CY Placed	Running Total	Sample No. (every 5000 CY)	Standard Compaction			Liquid Limit	Plastic Limit	Plasticity Index
													Max dry (pcf)	Opt Moist %	Initial Moist %			
5/22/2001	NA	NA	NA	used existing stockpile	NA	8 - 6	Yes	Yes		see month's end								
5/23/2001	NA	NA	NA	used existing stockpile	NA	8 - 7	Yes	No	small parts of two stakes missing	see month's end								
						8 - 8	Yes											
						9/10 - 1	Yes											
						9/10 - 1 regrade	Yes											
						9/10 - 1 regrade (2nd)	Yes											
						9/10 -2	Yes											
5/24/2001	NA	NA	NA	used existing stockpile	NA	9/10 - 3	Yes	Yes		see month's end		L-OCF-TBL-4-4-S-4	127.8	10.3	10	50	14	36
						9/10 - 4	Yes											
5/25/2001	NA	NA	NA	used existing stockpile	NA	11 - 1	Yes	Yes		see month's end								
						11- 2	Yes											
						9/10 - 5	Yes											
5/29/2001	NA	NA	NA	used existing stockpile	NA	11 - 2 regrade	Yes	Yes		see month's end								
						9/10 - 6	Yes											
5/30/2001	NA	NA	NA	used existing stockpile	NA	12 south - 1	Yes	Yes		see month's end								
5/31/2001	NA	NA	NA	used existing stockpile	NA	11 - 3	Yes	Yes		4300	4300							
						9/10 - 7	Yes											
						12 south - 2	Yes											
6/1/2001	NA	NA	NA	used existing stockpile	NA	11 - 4	Yes	Yes										
6/4/2001	NA	NA	NA	used existing stockpile	NA	11 - 5	Yes	Yes		650	4950							
						12 south - 3	Yes											
6/6/2001	Yes	Yes	Pass		14.1, 12.9, 11.2													
6/7/2001	Yes	Yes	Pass		12.4, 11.2, 11.2, 10.6	11 - 6	Yes	Yes		600	5550	L-OCF-TBL-4-4-S-5	126.4	11.1	13	68	14	54
						11 - 7	Yes											
						11 - 8	Yes											
						12 south - 4	Yes											
						12 south - 5	Yes											
6/8/2001	Yes	Yes	Pass		11, 10.9, 11.9	11 - 9	Yes	Yes		625	6175	L-OCF-TBL-4-4-S-6	126.1	10.5	11	53	13	40
						12 south - 6	Yes					L-OCF-TBL-4-4-S-7	126.2	10	10	66	14	52
						12 south - 7	Yes											
6/9/2001	Yes	Yes	Pass		12.1, 8.9, 10.3													
6/13/2001	Yes	Yes	Pass		12.2, 13.5, 10.4	12 south - 8	Yes	Yes		660	6835							
						12 south - 9	Yes											
						12 north - 1	Yes											
						12 north - 1 regrade	Yes											
6/14/2001	Yes	Yes	Pass		11.9	12 north - 2	Yes	Yes		750	7585							
						12 north - 2 regrade	Yes											
						12 north - 3	Yes											
6/15/2001	Yes	Yes	Pass		10.9, 9.5, 9.2	12 north - 4	Yes	Yes		550	8135							
						12 north - 5	Yes											
						13 - 1	Yes											
						13 - 2	Yes											
						13 -2 regrade	Yes											
6/16/2001	Yes	Yes	Pass		9.5, 9.7													
6/18/2001	Yes	Yes	Pass		9.8, 10.2, 9.4	13 - 3	Yes	Yes		750	8885							
						13 - 4	Yes											
						12 north - 6	Yes											
						12 north - 6 regrade	Yes											
						12 north - 6 regrade (2nd)	Yes											
						12 north - 7	Yes											
6/19/2001	Yes	Yes	Pass		11, 10.1, 9.2	13 - 5	Yes	Yes		800	9685							
						13 - 5 regrade	Yes											
						13 - 5 regrade (2nd)	Yes											
						13 - 6	Yes											
						12 north - 8	Yes											
6/20/2001	Yes	Yes	Pass		8.3, 8.3, 8.5	12 north - 9	Yes	Yes		650	10335							
						13 - 7	Yes											
						13 - 8	Yes											
6/21/2001	Yes	Yes	Pass		9.3, 11.6, 10.5	13 - 9	Yes	Yes		650	10985							
						13 north - 10	Yes											
6/22/2001	Yes	Yes	Pass		9.6, 9.7, 8.3	14 - 1	Yes	Yes		450	11435							

OCF Table 4-4. Testing of Soil and Bentonite Prior to Compaction

Field Tests										*Lab Tests*								
Date	Percent Bentonite (see Contractor's summary for daily mixing information)	Visual Inspection of Mixed Material (Y/N)	Pass/ Fail	Comments	Daily Moisture Content of Mixed Material	Location of Material Placement *(panel and lift)*	Scarification (Y/N)	Stakes Accounted For (Y/N)	Explanation if not accounted for	Approximate Total CY Placed	Running Total	Sample No. (every 5000 CY)	Standard Compaction: Max dry (pcf)	Standard Compaction: Opt Moist %	Standard Compaction: Initial Moist %	Liquid Limit	Plastic Limit	Plasticity Index
						14 - 1 regrade	Yes											
						14 - 1 regrade (2nd)	Yes											
						14 - 2	Yes											
						14 - 3	Yes											
						14 - 4	Yes											
6/25/2001	Yes	Yes	Pass		11.6, 8.9	14 - 5	Yes	Yes		300	11735							
6/26/2001	Yes	Yes	Pass		10.8, 10.1, 10.4	14 - 6	Yes	Yes		250	11985							
						7 east - 6	Yes											
6/29/2001	Yes	Yes	Pass		11.1, 10.4, 10.7	7 east - 7	Yes	Yes		700	12685							
						14 - 7	Yes											
						14 - 8	Yes											
7/2/2001	Yes	Yes	Pass		11.1	7 east - 8	Yes	Yes		84	12769							
7/3/2001	Yes	Yes	Pass		9.1, 10.3	6 - 6	Yes	Yes		350	13119							
7/5/2001	NA	NA	NA	No pugging	NA	7 east - 9	Yes	Yes		500	13619							
7/6/2001	NA	NA	NA	No pugging	NA	7 east - 10	Yes	Yes		250	13869							
						15 - 1	Yes											
7/9/2001	NA	NA	NA	No pugging	NA	15 - 2	Yes	Yes		150	14019							
						LCRS Sump - 1	Yes											
						LCRS Sump - 2	Yes											
						LCRS Sump - 3	Yes											
7/10/2001	Yes	Yes	Pass		11.1	15 - 3	Yes	Yes		250	14269							
						LCRS Sump - 4	Yes											
						LCRS Sump - 5	Yes											
						LCRS Sump - 6	Yes											
						LCRS Sump - 7	Yes											
						21 - 1	Yes											
						21 - 2	Yes											
7/11/2001	Yes	Yes	Pass		10.8, 11.1, 12.3	21 - 3	Yes	Yes		500	14769							
						21 - 4	Yes											
						21 - 5	Yes											
						21 - 6	Yes											
						21 - 7	Yes											
7/12/2001	Yes	Yes	Pass		10.2, 11.2, 11.4	21 - 8	Yes	Yes		100	14869							
						15 - 4	Yes											
						LCRS Sump - 8	Yes											
						LCRS Sump - 9	Yes											
						LCRS Sump - 10	Yes											
						LCRS Sump - 11	Yes											
						LCRS Sump - 12	Yes											
7/13/2001	NA	NA	NA	No pugging	NA	15 - 5	Yes	Yes		250	15119							
						17 - 1	Yes											
						17 - 2	Yes											
						17 - 3	Yes											
						17 - 4	Yes											
						17 - 5	Yes											
						17 - 6	Yes											
						17 - 7	Yes											
						17 - 8	Yes											
7/16/2001	Yes	Yes	Pass		13, 11.5, 11.3	17 - 9	Yes	Yes		100	15219							
						21 - 9	Yes											
						15 - 6	Yes											
						17 - 10	Yes											
						15 - 7	Yes											
7/17/2001	Yes	Yes	Pass		12.7, 12.6	15 - 8	Yes	Yes		700	15919							
						16 - 1	Yes											
						16 - 2	Yes											
7/18/2001	NA	NA	NA	No pugging	NA	16 - 3	Yes	Yes		500	16419							
						16 - 4	Yes											
						16 - 5	Yes											
						16 - 6	Yes											
						16 - 7	Yes											

OCF Table 4-4. Testing of Soil and Bentonite Prior to Compaction																		
Field Tests										*Lab Tests*								
Date	Percent Bentonite (see Contractor's summary for daily mixing information)	Visual Inspection of Mixed Material (Y/N)	Pass/ Fail	Comments	Daily Moisture Content of Mixed Material	Location of Material Placement (panel and lift)	Scarification (Y/N)	Stakes Accounted For (Y/N)	Explanation if not accounted for	Approximate Total CY Placed	Running Total	Sample No. (every 5000 CY)	Standard Compaction			Liquid Limit	Plastic Limit	Plasticity Index
													Max dry (pcf)	Opt Moist %	Initial Moist %			
						16 - 8	Yes											
						16 - 9	Yes											
8/31/2001												L-OCF-TBL-4-4-S-8	126.6	9.2	10	55	13	42
8/1/2003												L-OCF-TBL4-4-S-9	127.8	10.4	11.5	37	13	24
												L-OCF-TBL4-4-S-10	127.9	9.8	13.5	40	13	27
												L-OCF-TBL4-4-S-11	127.3	9.3	12.6	43	14	29
												L-OCF-TBL4-4-S-12	127.9	9.7	10.6	41	12	29

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Soil / Bentonite - Field																		Soil / Bentonite - Lab												
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Required Visual Checks (1 per Panel/Lift)	No. of Cycles for Each Panel/Lift	Equip. Type for Each Panel/Lift	Equip. Weight with Vibration (lbs)	Equip. Weight without Vibration (lbs)	Water Content Percent - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.2 - 14.2% and no below 9.2%)	Percent Compaction - Nuclear (5 per Acre/Lift)	Pass/ Fail (<3% below 95%)	Dry Density - Nuclear (pcf) (5 per Acre/Lift)	Pass/Fail (<3% with no <5 pcf of value identified as 122 pcf (117 pcf)	Wet Density - Nuclear (pcf)	Sample No. for Density - Sand Cone (1 per 20 Nuclear)	Dry Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Dry Density (pcf)	Wet Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Wet Density (pcf)	Sample No. for Water Content - Oven (1 per 10 Nuclear)	Water Content Percent - Oven	Difference Between Oven and Nuclear Water Content (%)	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec)	Pass/ Fail (<5% > $5x10^{-7}$ cm/sec)	Moisture Content (%)	Dry Density (pcf)
8/24/2000	20 - South	1	140	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.2	Pass	96	Pass	124.1	Pass	139.2									L-OCF-TBL4-5-HC-1	3.3×10^{-9}	Pass	12.0	128.6
	20 - South	1	141	55							12.7	Pass	96	Pass	123.7	Pass	139.4													
	20 - North	1	148	39		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.1	Pass	97	Pass	124.4	Pass	139.5									L-OCF-TBL4-5-HC-2	1×10^{-9}	Pass	12.0	126.8
	20 - South	2	146	64		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.5	Pass	97	Pass	125.0	Pass	139.4									L-OCF-TBL4-5-HC-4	3.1×10^{-9}	Pass	12.0	129.5
	20 - South	2	147	42							11.8	Pass	97	Pass	125.1	Pass	139.9													
	20 - North	1	149A	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.3	Pass	97	Pass	125.1	Pass	139.2						L-OCF-TBL4-5 WC-1	10.7	-0.6					
	20 - North	1	149B	60	149C						11.0	Fail (retested)	98	Pass	126.1	Pass	140.0									L-OCF-TBL4-5-HC-3	6.0×10^{-8}	Pass	11.0	128.8
	20 - North	1	149C	60							12.0	Pass	97	Pass	124.7	Pass	139.6													
8/25/2000	20 - North	2	156	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.4	Pass	96	Pass	124.0	Pass	139.1													
	20 - North	2	157	60							11.5	Pass	98	Pass	126.6	Pass	141.8													
	20 - South	3	154	58		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.0	Pass	96	Pass	124.2	Pass	142.7													
	20 - South	3	155A	35							11.1	Accepted (Pass)	99	Pass	127.6	Pass	139.4													
	20 - South	3	155B	35							11.0	Fail (outlier)	100	Pass	128.5	Pass	141.2						L-OCF-TBL4-5 WC-2	10.8	-0.2	L-OCF-TBL4-5-HC-5	2.6×10^{-9}	Pass	11.0	128.8
8/26/2000	20 - North	3	158	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.0	Pass	97	Pass	123.9	Pass	140.0						L-OCF-TBL4-5 WC-3	12.3	-0.7					
	20 - North	3	159	45							12.5	Pass	98	Pass	125.4	Pass	141.1													
	19 - South	1	160	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.9	Pass	97	Pass	124.1	Pass	140.1													
	19 - South	1	161	75							13.3	Pass	95	Pass	121.6	Accepted (Pass)	137.8													
	19 - South	1	161A	75							13.3	Pass	96	Pass	122.9	Pass	139.2													
	20 - North	4	162	68		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.4	Pass	95	Pass	122.6	Pass	139.0													
	20 - North	4	163	55							13.2	Pass	96	Pass	122.8	Pass	138.9													
	19 - South	2	164	68 (note: at 8" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.5	Pass	97	Pass	124.6	Pass	140.1													
8/27/2000																														
8/28/2000	19 - North	1	167	65	167A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	14.4	Fail (retested)	93	Fail (retested)	118.8	Fail (retested)	139.3													
	19 - North	1	168	76	168A						14.2	Pass	93	Fail (retested)	119.7	Fail (retested)	138.4													
	19 - South	2	165	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.7	Pass	95	Pass	122.5	Pass	138.6													
	19 - South	2	166	50	166A						13.4	Pass	95	Fail (retested)	122.0	Fail (retested)	135.9													
	19 - South	2	166A	50							13.2	Pass	95	Pass	122.4	Pass	136.7													
8/29/2000	19 - North	1	167A	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.4	Pass	95	Pass	121.6	Accepted (Pass)	137.9													
	19 - North	1	168A	76	168B						14.2	Pass	93	Fail (retested)	119.7	Fail (retested)	136.7													
	19 - North	1	168B	76	168C						14.1	Pass	94	Fail (retested)	120.0	Fail (retested)	137.0													
	20 - South	4	169	35		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.8	Pass	98	Pass	125.3	Pass	140.0													
	20 - South	4	170	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.7	Pass	97	Pass	124.9	Pass	140.8													
	19 - South	3	171A	70	171B						13.4	[illegible]	93	[illegible]	119.9	[illegible]	135.9													
	19 - South	3	171B	70	171C						13.7	[illegible]	93	[illegible]	119.1	[illegible]	135.4													
	19 - South	3	171C	70	171D						13.3	[illegible]	94	[illegible]	120.5	[illegible]	136.5													
	20 - South	5	172	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.9	Pass	97	Pass	124.9	Pass	139.8													
8/30/2000	18 - South	3	173	78							14.7	[illegible]	92	[illegible]	118.7	[illegible]	136.1													
	19 - North	1	168C	76		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.4	Pass	94	Fail (note: over 3' of material placed above this lift)	121.1	Fail (note: over 3' of material placed above this lift)	137.3													
	19 - South	3	171D	70							13.8	[illegible]	95	[illegible]	122.1	[illegible]	139.0													
	19 - South	3	174	65							12.8	[illegible]	95	[illegible]	122.2	[illegible]	137.7													
8/31/2000	18 - South	2	175	70							11.9	[illegible]	96	[illegible]	123.9	[illegible]	138.8													
	18 - South	2	176	60							12.5	[illegible]	94	[illegible]	120.4	[illegible]	135.4													
	18 - North	2	177	75							11.7	[illegible]	96	[illegible]	123.0	[illegible]	137.4													
	18 - North	1	178	68							14.3	[illegible]	92	[illegible]	118.5	[illegible]	135.5													
	18 - North	1	179	69							13.2	[illegible]	96	[illegible]	122.9	[illegible]	139.0													
	18 - North	1	180	58							13.9	[illegible]	92	[illegible]	118.8	[illegible]	135.3													
	19 - South	3	171E	76							13.7	[illegible]	93	[illegible]	119.0	[illegible]	135.2	L-OCF-TBL4-5-SC-1					L-OCF-TBL4-5 WC-4			L-OCF-TBL4-5-HC-6				
	19 - South	3	174A	65							14.0	[illegible]	94	[illegible]	120.7	[illegible]	137.6													
	18 - South	3	181	80							13.6	[illegible]	94	[illegible]	120.6	[illegible]	137.0													
	20 - South	6	182	75	248	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	14.3	Fail (retested)	92	Fail (retested)	118.6	Fail (retested)	135.5						L-OCF-TBL4-5 WC-5	13	-1.28					
	18 - South	1	183	68							13.5	[illegible]	93	[illegible]	119.7	[illegible]	135.9						L-OCF-TBL4-5 WC-6							
	19 - North	1	184	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.1	Pass	95	Pass	122.0	Pass	138.0						L-OCF-TBL4-5 WC-7	11.5	-1.62					
9/1/2000	18 - North	1	185	70							11.5	[illegible]	97	[illegible]	124.9	[illegible]	139.2									L-OCF-TBL4-5-HC-7				
	18 - North	1	186	68							12.5	[illegible]	97	[illegible]	124.2	[illegible]	139.7													
	19 - North	1	187	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.8	Pass	94	Fail (note: over 3' of material placed above this lift)	120.8	Fail (note: over 3' of material placed above this lift)	137.1						L-OCF-TBL4-5 WC-8	12.7	-1.13					
	19 - North	1	188	70							12.1	Pass	95	Pass	122.1	Pass	136.8									L-OCF-TBL4-5-HC-8	1.3×10^{-9}	Pass	12.0	125.5
	19 - North	1	189	65							11.8	Pass	98	Pass	125.3	Pass	140.2						L-OCF-TBL4-5 WC-9	11.7	-0.17					
	19 - South	3	190	70							14.4	[illegible]	94	[illegible]	120.3	[illegible]	137.6						L-OCF-TBL4-5 WC-10							
	18 - South and 19 - North seam	1	191	55							12.2	Pass	96	Pass	122.8	Pass	137.7						L-OCF-TBL4-5 WC-11	12.2	+0.01					
	19 - North	1	192	70 (note: at 4" depth not 6")							13.6	Pass	91	Fail (note: over 3' of material placed above this lift)	116.6	Fail (note: over 3' of material placed above this lift)	132.5						L-OCF-TBL4-5 WC-12	13.6	0					
9/2/2000																														
9/3/2000																														
9/4/2000																														
9/5/2000	18 - South	1	193	75	193A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.5	Pass	93	Fail (retested)	118.8	Fail (retested)	134.9													
	18 - South	1	194	60	194A						13.7	Pass	93	Fail (retested)	119.5	Fail (retested)	135.9													
	18 - North	1	195	70	195A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.6	Pass	94	Fail (retested)	120.4	Fail (retested)	136.8													
	19 - South	2	196	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	14.1	Pass	90	Fail (note: about 3' of material placed above this lift)	115.5	Fail (note: about 3' of material placed above this lift)	131.8													
	19 - South	2	197	55							13.4	Pass	97	Pass	124.0	Pass	140.6													
	19 - South	2	198	55 (note: at 8" depth not 6")							13.0	Pass	97	Pass	124.0	Pass	140.1													
9/6/2000																														
9/7/2000	19 - North	2	199	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.6	Pass	97	Pass	125.0	Pass	140.8													
	19 - North	2	200	60							11.5	Pass	98	Pass	125.3	Pass	139.7						L-OCF-TBL4-5 WC-13	9.7	-1.8					
	18 - South	1	193A	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.6	Pass	96	Pass	123.4	Pass	139.0													
	18 - South	1	194A	60	194B						11.3	Pass	92	Fail (retested)	118.3	Fail (retested)	131.6													
	18 - North	1	195A	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.5	Pass	96	Pass	123.6	Pass	139.1													
	18 - North	1	201	65							12.6	Pass	97	Pass	124.1	Pass	139.8	L-OCF-TBL4-5-SC-2	124.8	+0.7	138.5	-1.3	L-OCF-TBL4-5 WC-14	11	-1.59					

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Soil / Bentonite - Field																		Soil / Bentonite - Lab												
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Required Visual Checks (1 per Panel/Lift)	No. of Cycles for Each Panel/Lift	Equip. Type for Each Panel/Lift	Equip. Weight with Vibration (lbs)	Equip. Weight without Vibration (lbs)	Water Content Percent - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.2 - 14.2% and no below 9.2%)	Percent Compaction - Nuclear (5 per Acre/Lift)	Pass/ Fail (<3% below 95%)	Dry Density - Nuclear (pcf) (5 per Acre/Lift)	Pass/Fail (<3% with no <5 pcf of value identified as 122 pcf (117 pcf)	Wet Density - Nuclear (pcf)	Sample No. for Density - Sand Cone (1 per 20 Nuclear)	Dry Density- Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Dry Density (pcf)	Wet Density- Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Wet Density (pcf)	Sample No. for Water Content - Oven (1 per 10 Nuclear)	Water Content Percent - Oven	Difference Between Oven and Nuclear Water Content (%)	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec)	Pass/ Fail (<5% > 5x10^-7 cm/sec)	Moisture Content (%)	Dry Density (pcf)
	19 - South	3	202	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.1	Accepted (Pass)	97	Pass	124.4	Pass	138.3									L-OCF-TBL4-5-HC-10	3.3×10^{-8}	Pass	11.4	124.5
	19 - South	3	203	70							12.0	Pass	98	Pass	125.6	Pass	140.6													
	19 - North	3	204	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.1	Pass	97	Pass	124.5	Pass	139.5						L-OCF-TBL4-5 WC-15	11	-1.09					
	19 - South	3	205	50		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.0	Pass	96	Pass	123.8	Pass	138.7						L-OCF-TBL4-5 WC-16	11.3	-0.74					
	18 - South and 19 - North seam	2	206	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.9	Pass	97	Pass	125.0	Pass	139.8						L-OCF-TBL4-5 WC-17	11.7	-0.2					
	18 - South	2	207	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.7	Pass	99	Pass	126.7	Pass	141.5						L-OCF-TBL4-5 WC-18	10.9	-0.76					
	18 - North	2	208	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.6	Pass	97	Pass	124.2	Pass	139.9													
	18 - South	2	209	70							11.8	Pass	97	Pass	124.8	Pass	139.5													
	18 - South	1	194B	60							11.8	Pass	98	Pass	125.6	Pass	140.3									L-OCF-TBL4-5-HC-9	2.9×10^{-8}	Pass	11.8	126.3
9/8/2000	18 - North	3	210	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.0	Pass	97	Pass	125.1	Pass	140.0						L-OCF-TBL4-5 WC-19	11	-0.97					
	18 - South	3	211	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.4	Pass	97	Pass	125.2	Pass	140.8													
	19 - North	4	212	70	212A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.7	Pass	93	Fail (retested)	120.0	Fail (retested)	136.4													
	19 - North	4	212A	70							12.8	Pass	97	Pass	124.2	Pass	140.1													
	19 - North	4	213	60							11.5	Pass	98	Pass	126.2	Pass	140.6						L-OCF-TBL4-5 WC-20	10.4	-1.05					
	19 - South	4	214	70							12.1	Pass	96	Pass	122.9	Pass	137.7	L-OCF-TBL4-5-SC-3	124.1	+1.2	137.7	0	L-OCF-TBL4-5 WC-21	11	-1.11					
	19 - South	4	215	63		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.6	Pass	95	Pass	122.8	Pass	138.3									L-OCF-TBL4-5-HC-11	5.2×10^{-8}	Pass	10.9	122.2
	18 - North	4	216	20		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.4	Pass	96	Pass	123.9	Pass	139.3													
	18 - South	4	217	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.1	Pass	95	Pass	122.5	Pass	138.6													
9/9/2000	19 - South	5	218	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.7	Pass	98	Pass	126.3	Pass	141.1													
	19 - South	5	219	55							13.3	Pass	95	Pass	122.4	Pass	138.6						L-OCF-TBL4-5 WC-23	11.8	-1.5					
	18 - North	6	220	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.1	Pass	95	Pass	121.5	Accepted (Pass)	137.3	L-OCF-TBL4-5-SC-4	122.9	+1.4	137.7	+0.4	L-OCF-TBL4-5 WC-24	12	-1.06					
	18 - South	5	221	70	221A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.7	Pass	94	Fail (retested)	120.3	Fail (retested)	136.8													
	18 - South	5	221A	70	221B						14.1	Pass	93	Fail (retested)	119.9	Fail (retested)	136.8													
	18 - South	5	222	65	222A						13.7	Pass	95	Pass	121.5	Fail (retested)	138.1													
	19 - North	5	223	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.1	Pass	97	Pass	124.7	Pass	139.7													
	19 - North	5	224	60							12.0	Pass	98	Pass	125.8	Pass	140.9													
	18 - South	5	221B	70							12.9	Pass	96	Pass	122.8	Pass	138.7													
	18 - South	5	222A	65							13.1	Pass	96	Pass	123.4	Pass	139.5													
	18 - South	6	225	65	225A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.6	Pass	94	Fail (retested)	120.3	Fail (retested)	136.6													
9/10/2000																														
9/11/2000	18 - South	6	225A	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.9	Pass	95	Pass	122.1	Pass	137.9													
	19 - North	6	226	62		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.5	Pass	96	Pass	123.7	Pass	139.2													
	19 - North	6	227	78							12.3	Pass	97	Pass	124.2	Pass	139.5													
	19 - South	6	228	72		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.9	Pass	97	Pass	124.1	Pass	140.1													
	19 - South	6	229	49							13.2	Pass	96	Pass	123.8	Pass	140.2													
9/12/2000	20 - North	5	230	75		Yes	5	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.6	Pass	98	Pass	125.4	Pass	141.1													
	20 - North	5	231	55							13.5	Pass	95	Pass	121.7	Accepted (Pass)	138.1													
	13 - North	1	232	85		Yes	7	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.2	Pass	95	Pass	122.1	Pass	137.0						L-OCF-TBL4-5 WC-25	11.3	-0.9					
	13 - North	1	233	55							11.9	Pass	99	Pass	127.5	Pass	142.6						L-OCF-TBL4-5 WC-26	11.8	-0.1					
	13 - North	1	232A	85	232B						13.9	Pass	93	Fail (retested)	120.0	Fail (retested)	136.7													
	13 - North	1	234	55	234A						14.1	Pass	93	Fail (retested)	119.9	Fail (retested)	136.7													
	13 - South	1	235	70		Yes	7	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.3	Pass	95	Pass	121.9	Accepted (Pass)	138.1													
	20 - North	6	236	75	236A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.9	Pass	93	Fail (retested)	119.3	Fail (retested)	135.9													
	20 - North	6	237	65							12.8	Pass	96	Pass	123.6	Pass	139.4													
	20 - North	6	238	55							12.2	Pass	95	Pass	122.0	Pass	136.9													
	13 - North	1	232B	85							12.4	Pass	97	Pass	124.0	Pass	139.4						L-OCF-TBL4-5 WC-27	11	-1.4					
	13 - South	1	235A	75		Yes	6	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.3	Pass	95	Pass	123.1	Pass	138.3													
	13 - South	1	239	50		Yes					13.1	Pass	95	Pass	122.4	Pass	138.4									L-OCF-TBL4-5-HC-12	1.4×10^{-9}	Pass	12.6	124.0
	13 - North	1	234A	55		Yes	7	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.0	Pass	96	Pass	123.0	Pass	139.0													
9/13/2000	4 - South	1	240	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.4	Pass	94	Fail (outlier)	120.7	Fail (outlier)	136.9													
	4 - North	1	241	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.9	Pass	95	Pass	122.4	Pass	139.5													
	20 - North	6	236A	40	236B	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	14.9	Fail (retested)	94	Fail (retested)	121.3	Fail (retested)	139.4													
	20 - North	6	237A	65	237B						13.8	Pass	95	Pass	121.6	Fail (retested)	138.4													
	4 - North	1	242	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.8	Pass	94	Fail (outlier)	121.1	Fail (outlier)	137.9													
	3 - South	2	243	15		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.9	Pass	96	Pass	123.5	Pass	139.5													
	3 - South	2	244	55							11.8	Pass	97	Pass	125.2	Pass	138.9						L-OCF-TBL4-5 WC-30	10.5	-1.3					
	3 - North	1	245	50	245A	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.4	Pass	94	Fail (retested)	121.4	Fail (retested)	137.7													
	1 - North	1	246	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.6	Pass	97	Pass	125.3	Pass	141.1													
	1 - North	1	247	35	247A						13.7	Pass	95	Pass	121.8	Fail (retested)	138.5													
	1 - North	1	247A	35		Yes	6	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.5	Pass	96	Pass	123.1	Pass	139.7													
	20 - South	6	248	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.6	Pass	95	Pass	122.7	Pass	139.4													
	20 - South	6	249	35							12.6	Pass	96	Pass	123.7	Pass	139.4													
	3 - North	1	250	80							13.6	Pass	95	Pass	122.6	Pass	139.3													
	3 - North	1	245A	50							12.8	Pass	98	Pass	125.8	Pass	141.9													
	3 - South	2	251	40							12.2	Pass	98	Pass	125.1	Pass	141.1													
	3 - South	2	252	60							12.2	Pass	98	Pass	126.3	Pass	141.6													
	20 - North	6	237B	65							13.1	Pass	95	Pass	122.7	Pass	138.8													
	20 - North	6	236B	40							13.3	Pass	95	Pass	122.6	Pass	138.9													
	20 - South	6	253	40							11.6	Pass	99	Pass	127.0	Pass	141.7													
	20 - South	6	254-1	70							12.8	Pass	96	Pass	123.3	Pass	139.1													
9/14/2000	1 - North	2	255	73		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.9	Pass	96	Pass	123.3	Pass	138.4						L-OCF-TBL4-5 WC-31	11.9	-1	L-OCF-TBL4-5-HC-14	2×10^{-9}	Pass	12.0	126.8
	1 - North	2	256	25							12.0	Pass	99	Pass	126.9	Pass	142.2													
	20 - South	6	254-2	69		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.8	Pass	97	Pass	125.1	Pass	139.9	L-OCF-TBL4-5-SC-5	124.9	-0.2	138.6	-1.3	L-OCF-TBL4-5 WC-28	11	-0.8					
	3 - North	2	257	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	11.9	Pass	97	Pass	125.2	Pass	140.1						L-OCF-TBL4-5 WC-32	11.3	-0.6					
	3 - North	2	258	45							10.1	Fail (outlier)	100	Pass	128.0	Pass	141.0						L-OCF-TBL4-5 WC-33	10.1	0	L-OCF-TBL4-5-HC-15	3×10^{-9}	Pass	11.0	128.8
	3 - South	3	259	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.2	Pass	97	Pass	125.4	Pass	140.7													
	3 - South	3	260	65							11.8	Pass	98	Pass	126.0	Pass	140.8						L-OCF-TBL4-5 WC-34	11.1	-0.7					
	4 - North	1	241A	85	241B	Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	13.1	Pass	94	Fail (retested)	121.1	Fail (retested)	137.0													
	1 - North	3	261	73		Yes	4	Ingersol Rand 5D-115D Pro-Pac	55000	27400	12.7	Pass	95	Pass	122.5	Pass	138.1						L-OCF-TBL4-5 WC-35	10.4	-2.3					
	1 - North	3	262	40							13.9	Pass	93	Fail (outlier)	120.0	Fail (outlier)	136.7													
	4 - North	1	263	48							12.5	Pass	96	Pass	123.4	Pass	138.8													
	4 - North	1	241B	85							11.9	Pass	97	Pass	124.3	Pass	139.2						L-OCF-TBL4-5 WC-29	11.8	-0.1	L-OCF-TBL4-5-HC-13	4×10^{-9}	Pass	13.0	119.5
	3 - South	3	264	79	264A						13.3	Pass	94	Fail (retested)	120.9	Fail (retested)	137.0													
9/15/2000	1 - North	2	265	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.7	Pass	98	Pass	126.0	Pass	140.7													
	1 - North	3	266	70 (note: at 8" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	99	Pass	127.1	Pass	141.7													
	1 - North	3	266A	70							12.2	Pass	98	Pass	125.8	Pass	141.2													

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Soil / Bentonite - Field																		Soil / Bentonite - Lab												
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Required Visual Checks (1 per Panel/Lift)	No. of Cycles for Each Panel/Lift	Equip. Type for Each Panel/Lift	Equip. Weight with Vibration (lbs)	Equip. Weight without Vibration (lbs)	Water Content Percent - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.2 - 14.2% and no below 9.2%)	Percent Compaction - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% below 95%)	Dry Density - Nuclear (pcf) (5 per Acre/Lift)	Pass/Fail (<3% with no <5 pcf of value identified as 122 pcf (117 pcf)	Wet Density - Nuclear (pcf)	Sample No. for Density - Sand Cone (1 per 20 Nuclear)	Dry Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Dry Density (pcf)	Wet Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Wet Density (pcf)	Sample No. for Water Content - Oven (1 per 10 Nuclear)	Water Content Percent - Oven	Difference Between Oven and Nuclear Water Content (%)	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec)	Pass/Fail (<5% > 5x10^-7 cm/sec)	Moisture Content (%)	Dry Density (pcf)
	1 - North	3	266B	70							11.9	Pass	98	Pass	126.1	Pass	141.1													
	1 - North	2	267	40							12.3	Pass	98	Pass	126.1	Pass	141.7													
	1 - North	3	268	40	268A						14.1	Pass	93	Fail (retested)	119.1	Fail (retested)	135.9													
	1 - North	3	268A	40							13.1	Pass	95	Pass	122.8	Pass	138.8													
	4 - North	2	269	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.7	Pass	96	Pass	124.0	Pass	138.5	L-OCF-TBL4-5-SC-6	120.8	-3.2	134.6	-3.9	L-OCF-TBL4-5 WC-37	11.4	-0.3					
	4 - South	2	270	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.3	Pass	98	Pass	126.5	Pass	140.8													
	4 - South	2	271	90							12.4	Pass	97	Pass	124.4	Pass	139.8													
	4 - North	2	272	60							12.2	Pass	98	Pass	125.7	Pass	141.0													
	3 - North	3	273	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.5	Pass	96	Pass	122.9	Pass	139.5													
	3 - North	3	274	40							12.3	Pass	98	Pass	125.9	Pass	141.4													
	1 - North	4	275	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	98	Pass	126.2	Pass	140.7													
	1 - North	4	276	33							11.2	Pass	98	Pass	125.9	Pass	139.9						L-OCF-TBL4-5 WC-38	10.9	-0.3					
9/16/2000	3 - North	4	277	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.2	Pass	95	Pass	122.4	Pass	138.6													
	3 - North	4	278	40							11.8	Pass	97	Pass	124.6	Pass	139.3													
	4 - Middle	3	279	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.7	Pass	98	Pass	125.8	Pass	140.6													
	4 - North	3	280	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.7	Pass	95	Pass	122.7	Pass	138.2													
	4 - South	3	281	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	14.3	Fail (outlier)	94	Fail (outlier)	121.3	Fail (outlier)	138.6													
	3 - South	3	264A	79		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	14.1	Pass	95	Pass	122.5	Pass	139.8						L-OCF-TBL4-5 WC-36	12	-2.1	L-OCF-TBL4-5-HC-16	1 x 10^{-9}	Pass	11.0	129.7
	3 - South	3	282	45							11.5	Pass	99	Pass	127.0	Pass	141.6						L-OCF-TBL4-5 WC-39	10.5	-1					
	1 - North	5	283	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.1	Pass	95	Pass	122.0	Pass	138.0													
	1 - North	5	283A	70		Yes	5	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.9	Pass	96	Pass	123.2	Pass	139.1	L-OCF-TBL4-5-SC-7	122.9	-0.3	137.7	-1.4	L-OCF-TBL4-5 WC-41	11.7	-1.2					
	1 - North	5	284	40		Yes	6	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.9	Pass	96	Pass	122.9	Pass	138.7													
	3 - North	5	285	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.5	Pass	97	Pass	124.2	Pass	139.6													
	3 - North	5	286	45							12.1	Pass	95	Pass	122.7	Pass	137.5						L-OCF-TBL4-5 WC-40	12.2	+0.1					
	4 - North	4	287	60	287A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.8	Pass	94	Fail (retested)	121.3	Fail (retested)	138.0													
	4 - North	4	287A	60		Yes	6	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.5	Pass	95	Pass	122.8	Pass	138.1													
	1 - North	5	288	55							12.2	Pass	96	Pass	123.7	Pass	138.8													
	4 - Middle	4	289	85	289A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.1	Pass	94	Fail (retested)	120.7	Fail (retested)	136.6													
	3 - South	4	290	80	290A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.6	Pass	94	Fail (retested)	120.6	Fail (retested)	137.0													
9/17/2000																														
9/18/2000	1 - North	6	291	70 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.1	Pass	97	Pass	124.4	Pass	139.5													
	20 - South	6	292	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.7	Pass	96	Pass	123.3	Pass	139.0									L-OCF-TBL4-5-HC-17	2 x 10^{-9}	Pass	13.0	123.9
	1 - North	6	293	30 (note: at 4" depth not 6")							13.1	Pass	96	Pass	122.8	Pass	138.9													
	3 - South	4	290A	80 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.9	Pass	95	Pass	122.6	Pass	138.4						L-OCF-TBL4-5 WC-42	12	-0.9					
	3 - South	4	294	65 (note: at 4" depth not 6")							13.1	Pass	96	Pass	123.2	Pass	139.3													
	3 - North	6	295	40 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13 5	Pass	95	Pass	122.4	Pass	138.9													
	3 - North	6	296	70 (note: at 4" depth not 6")							13.2	Pass	95	Pass	122.6	Pass	138.8													
	4 - South	4	297	80 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.0	Pass	95	Pass	122.6	Pass	138.5									L-OCF-TBL4-5-HC-18	1 x 10^{-8}	Pass	12.0	124.1
	4 - Middle	4	289A	85 (note: at 4" depth not 6")							12.5	Pass	97	Pass	124.4	Pass	139.9													
	1 - North	7	298	50 (note: at 4" depth not 6")	298A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.1	Pass	94	Fail (retested)	121.3	Fail (retested)	137.2													
	1 - North	7	299	50 (note: at 4" depth not 6")							13.1	Pass	96	Pass	123.2	Pass	139.4													
	3 - North	7	300	50 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.8	Pass	96	Pass	123.0	Pass	138.7													
	3 - North	7	301	80 (note: at 4" depth not 6")	301A						13.7	Fail (retested)	94	Fail (retested)	121.2	Fail (retested)	137.8													
	1 - North	7	298A	50 (note: at 4" depth not 6")							13.0	Pass	95	Pass	122.7	Pass	138.7													

Note: Gray shade in[illegible]ed.

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Soil / Bentonite - Field																		Soil / Bentonite - Lab												
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Required Visual Checks (1 per Panel/Lift)	No. of Cycles for Each Panel/Lift	Equip. Type for Each Panel/Lift	Equip. Weight with Vibration (lbs)	Equip. Weight without Vibration (lbs)	Water Content Percent - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.2 - 14.2% and no below 9.2%)	Percent Compaction - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% below 95%)	Dry Density - Nuclear (pcf) (5 per Acre/Lift)	Pass/Fail (<3% with no <5 pcf of value identified as 122 pcf (117 pcf)	Wet Density - Nuclear (pcf)	Sample No. for Density - Sand Cone (1 per 20 Nuclear)	Dry Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Dry Density (pcf)	Wet Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Wet Density (pcf)	Sample No. for Water Content - Oven (1 per 10 Nuclear)	Water Content Percent - Oven	Difference Between Oven and Nuclear Water Content (%)	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec)	Pass/Fail (<5% > 5x10^{-7} cm/sec)	Moisture Content (%)	Dry Density (pcf)
9/19/2000	3 - North	7	301A	80 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.7	Pass	95	Pass	122.7	Pass	138.3													
	3 - South	5	302	65 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.8	Pass	96	Pass	122.8	Pass	138.6													
	4 - South	5	303	65 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.5	Pass	97	Pass	124.7	Pass	140.3													
	4 - North	5	304	75 (note: at 4" depth not 6")							12.7	Pass	96	Pass	124.0	Pass	139.8	L-OCF-TBL4-5-SC-8	125.3	+1.3	139.9	+0.1	L-OCF-TBL4-5 WC-43	11.6	-1.1					
	1 - North	8	305	30 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.2	Pass	97	Pass	125.1	Pass	140.4													
	1 - North	8	306	68 (note: at 4" depth not 6")							11.9	Pass	96	Pass	123.0	Pass	137.6													
9/20/2000																														
9/21/2000	3 - South	6	319	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.9	Pass	97	Pass	124.8	Pass	139.7						L-OCF-TBL4-5 WC-44	10.8	-1.1					
	3 - North	8	320	30		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.0	Pass	97	Pass	125.1	Pass	140.2													
9/22/2000	4 - South	6	321	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.3	Pass	96	Pass	123.8	Pass	139.0													
	3 - North	9	322	40		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.9	Pass	96	Pass	123.8	Pass	139.8													
	3 - South	6	323	40		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.6	Pass	97	Pass	124.1	Pass	139.7													
	3 - North	final	325	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.1	Pass	97	Pass	124.5	Pass	139.5													
	3 - North	final	326	30							12.2	Pass	96	Pass	122.8	Pass	137.8													
	3 - South	final	327	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.7	Pass	96	Pass	123.9	Pass	138.4													
	4 - North	final	328	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.1	Pass	96	Pass	122.9	Pass	137.8													
	4 - South	7	329	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.0	Pass	97	Pass	124.1	Pass	139.0													
9/23/2000	4 - North	final	330	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.3	Pass	98	Pass	125.8	Pass	140.1													
	5	1	331	75							11.0		98		126.6		140.2						L-OCF-TBL4-5 WC-45							
	5	1	332	65							11.0		100		128.7		142.9									L-OCF-TBL4-5-HC-19				
	5	2	333	70							11.3		97		124.7		138.9									L-OCF-TBL4-5-HC-20				
	5	2	334	75							11.6		100		128.0		142.9													
9/24/2000																														
9/25/2000	4 - South	final	335	80	335A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	10.9	Fail (retested)	99	Pass	126.9	Pass	140.8													
	6	1	336	70							11.4		99		126.8		141.2													
	6	1	337	50							10.6		101		129.4		143.2													
	5	3	338	55							10.7		99		127.6		141.2													
	5	3	339	75							11.7		96		123.2		137.8													
	4 - South	final	335A	80							12.0	Pass	97	Pass	124.4	Pass	139.3													
9/26/2000	5	1	340	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	99	Pass	127.2	Pass	141.9													
	5	1	341	80							12.1	Pass	97	Pass	124.9	Pass	140.0													
	5	2	342	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.8	Pass	97	Pass	125.2	Pass	139.9													
	5	2	343	50							11.7	Pass	97	Pass	125.2	Pass	139.9	L-OCF-TBL4-5-SC-9	118.6	-6.6	131.7	-8.2	L-OCF-TBL4-5 WC-46	11.1	-0.6	L-OCF-TBL4-5-HC-21	2.1 x 10[illegible]	Pass	11.3	124.7
	5	3	344	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.4	Pass	96	Pass	123.2	Pass	138.5													
	5	3	345	65							13.0	Pass	96	Pass	123.3	Pass	139.2													
	5	4	346	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.8	Pass	96	Pass	123.0	Pass	138.7													
	5	4	347	50							12.4	Pass	97	Pass	124.1	Pass	139.5													
9/27/2000	5	5	348	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.5	Pass	95	Pass	122.3	Pass	138.9													
	5	5	349	80							11.4	Pass	99	Pass	127.9	Pass	142.5													
	LCRS Trench	1	350	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.2	Pass	97	Pass	125.3	Pass	140.5													
	LCRS Trench	1	351	40 (note: at 4" depth not 6")							12.0	Pass	98	Pass	126.5	Pass	141.6													
	5	6	352	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.5	Pass	96	Pass	123.0	Pass	138.4													
	5	6	353	72							11.9	Pass	97	Pass	124.4	Pass	139.2													
	6 - West	1	354	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.0	Pass	95	Pass	122.6	Pass	137.4													
	6 - West	1	355	80							11.9	Pass	97	Pass	125.2	Pass	140.1													
	5	7	356	50		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.0	Pass	98	Pass	126.1	Pass	141.1													
	5	7	357	85							11.9	Pass	97	Pass	124.9	Pass	139.8						L-OCF-TBL4-5 WC-47	10.8	-1.1					
	LCRS Trench	2	358	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.2	Pass	97	Pass	124.9	Pass	140.2													
	LCRS Trench	2	359	20							11.2	Pass	97	Pass	124.8	Pass	138.8													
	6 - West	2	360	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.6	Pass	97	Pass	124.7	Pass	139.1													
	6 - West	2	361	70							11.8	Pass	95	Pass	122.8	Pass	137.2													
9/28/2000	6 - East	1	362	55	362A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.1	Fail (retested)	99	Pass	127.5	Pass	141.7													

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Soil / Bentonite - Field																		Soil / Bentonite - Lab												
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Required Visual Checks (1 per Panel/Lift)	No. of Cycles for Each Panel/Lift	Equip. Type for Each Panel/Lift	Equip. Weight with Vibration (lbs)	Equip. Weight without Vibration (lbs)	Water Content Percent - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.2 - 14.2% and no below 9.2%)	Percent Compaction - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% below 95%)	Dry Density - Nuclear (pcf) (5 per Acre/Lift)	Pass/Fail (<3% with no <5 pcf of value identified as 122 pcf (117 pcf))	Wet Density - Nuclear (pcf)	Sample No. for Density - Sand Cone (1 per 20 Nuclear)	Dry Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Dry Density (pcf)	Wet Density - Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Wet Density (pcf)	Sample No. for Water Content - Oven (1 per 10 Nuclear)	Water Content Percent - Oven	Difference Between Oven and Nuclear Water Content (%)	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec)	Pass/Fail (<5% > $5x10^{-7}$ cm/sec)	Moisture Content (%)	Dry Density (pcf)
	6 - East	1	363	80	363A						12.2	Pass	94	Fail (retested)	121.3	Fail (retested)	136.0													
	LCRS Trench	3	364	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.1	Pass	97	Pass	124.5	Pass	139.5													
	LCRS Trench	3	365	75	365A						11.6	Pass	95	Pass	121.7	Fail (retested)	135.9													
	6 - East	1	363A	80							11.5	Pass	95	Pass	122.4	Pass	136.4	L-OCF-TBL4-5-SC-10	125.7	+3.3	138.6	+2.2	L-OCF-TBL4-5 WC-48	10.3	-1.2					
	LCRS Trench	3	365A	75							11.8	Pass	98	Pass	126.1	Pass	141.0													
	6 - East	1	362A	55							11.6	Pass	99	Pass	127.1	Pass	141.8													
	6 - East	1	366	70							11.0	Fail (outlier)	97	Pass	124.2	Pass	137.9									L-OCF-TBL4-5-HC-22	1.4 x 10^{-8}	Pass	11.2	123.8
	7 - West	1	367	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.6	Pass	98	Pass	125.8	Pass	140.4													
	7 - West	1	368	50							11.8	Pass	98	Pass	126.6	Pass	141.5													
	LCRS Trench	4	369	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.9	Pass	98	Pass	126.2	Pass	141.2													
	LCRS Trench	4	370	25							11.4	Pass	98	Pass	126.1	Pass	140.5													
	6 - East	2	371	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.2	Pass	98	Pass	125.6	Pass	139.7													
	6 - East	2	372	60							11.2	Pass	99	Pass	126.7	Pass	140.9													
	LCRS Trench	5	373	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.8	Pass	97	Pass	124.1	Pass	138.8													
	LCRS Trench	5	374	40							11.2	Pass	98	Pass	126.4	Pass	140.4													
	7 - West	2	375	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.3	Pass	98	Pass	126.3	Pass	140.6													
	7 - West	2	376	45							11.5	Pass	97	Pass	124.6	Pass	138.9													
9/29/2000	LCRS Trench	6	377	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	99	Pass	127.3	Pass	141.9													
	LCRS Trench	6	378	78							11.2	Pass	98	Pass	126.2	Pass	140.3													
	LCRS Trench	7	379	55		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	98	Pass	126.6	Pass	141.1													
	LCRS Trench	7	380	25							11.8	Pass	98	Pass	126.0	Pass	140.8													
9/30/2000																														
10/1/2000																														
10/2/2000																														
10/3/2000																														
10/4/2000																														
10/5/2000	6	NA (0-6")	381	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.7	Pass	95	Pass	122.6	Pass	137.0													
	6	NA (6-12")	382	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.4	Pass	98	Pass	126.4	Pass	140.9													
	6	NA (12-18")	383	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.2	Pass	97	Pass	125.2	Pass	140.6						L-OCF-TBL4-5 WC-49	11.1	-1.1					
	6	NA (18-24")	384	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.5	Pass	97	Pass	124.1	Pass	139.5									L-OCF-TBL4-5-HC-23	2.0 x 10^{-8}	Pass	11.3	128.7
	6	NA (24-30")	385	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.0	Pass	98	Pass	126.2	Pass	141.4													
	6	NA (30-36")	386	60		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.9	Pass	98	Pass	126.6	Pass	141.6													
	6	NA (0-6")	387	42							11.7	Pass	97	Pass	125.0	Pass	139.6													
	6	NA (6-12")	388	42							12.6	Pass	97	Pass	124.7	Pass	140.3	L-OCF-TBL4-5-SC-11	125.6	+0.9	140.2	-0.1	L-OCF-TBL4-5 WC-50	11.6	-1					
	6	NA (12-18")	389	42							11.3	Pass	99	Pass	127.3	Pass	141.7													
	6	NA (18-24")	390	42							11.8	Pass	99	Pass	127.0	Pass	142.1													
	6	NA (24-30")	391	42							11.7	Pass	99	Pass	127.6	Pass	142.6													
	6	NA (30-36")	392	42							11.0	Fail (outlier)	100	Pass	129.6	Pass	143.2									L-OCF-TBL4-5-HC-24	9.5 x 10^{-9}	Pass	10.1	126.3
	6	NA (0-6")	393	75							12.9	Pass	95	Pass	121.8	Accepted (Pass)	137.5													
	6	NA (6-12")	394	75							11.5	Pass	99	Pass	127.8	Pass	142.5													
	6	NA (12-18")	395	75							11.4	Pass	99	Pass	127.6	Pass	142.1													
	6	NA (18-24")	396	75							11.9	Pass	99	Pass	127.1	Pass	142.2													
	6	NA (24-30")	397	75							11.3	Pass	97	Pass	124.8	Pass	138.9						L-OCF-TBL4-5 WC-51	10.4	-0.9					
	6	NA (30-36")	398	75							12.0	Pass	98	Pass	125.8	Pass	141.0													
	7 - West	NA (0-6")	399	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.3	Pass	96	Pass	123.5	Pass	138.5													
	7 - West	NA (6-12")	400	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.6	Pass	99	Pass	126.9	Pass	141.5													
	7 - West	NA (12-18")	401	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.6	Pass	98	Pass	126.6	Pass	142.5													
	7 - West	NA (18-24")	402	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.4	Pass	97	Pass	124.7	Pass	140.3													
	7 - West	NA (24-30")	403	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	98	Pass	125.7	Pass	140.1													
	7 - West	NA (30-36")	404	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.7	Pass	95	Pass	122.3	Pass	136.6													
	7 - West	NA (0-6")	405	40							11.9	Pass	98	Pass	125.6	Pass	140.5													
	7 - West	NA (6-12")	406	40							11.9	Pass	97	Pass	124.8	Pass	139.6													
	7 - West	NA (12-18")	407	40							11.3	Pass	99	Pass	126.7	Pass	141.0	L-OCF-TBL4-5-SC-12	125.6	-1.1	138.4	-2.6	L-OCF-TBL4-5 WC-52	10.2	-1.1					
	7 - West	NA (18-24")	408	40							11.4	Pass	100	Pass	128.0	Pass	142.5													
	7 - West	NA (24-30")	409	40							12.1	Pass	97	Pass	124.8	Pass	139.9													
	7 - West	NA (30-36")	410	40							12.3	Pass	96	Pass	123.8	Pass	139.0													
	5	final	411	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.8	Pass	97	Pass	124.7	Pass	139.4													
	5	final	412	60							11.8	Pass	97	Pass	124.3	Pass	138.9									L-OCF-TBL4-5-HC-25	6.4 x 10^{-8}	Pass	11.7	122.6
10/6/2000	7 - East	1	413	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.6	Pass	97	Pass	124.9	Pass	140.7													
	7 - East	1	414	40							11.0	Fail (outlier)	96	Pass	124.0	Pass	137.6									L-OCF-TBL4-5-HC-26	8.2 x 10^{-9}	Pass	11.9	121.7
	6	final	415	80		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.5	Pass	98	Pass	126.2	Pass	140.6													
	6	final	416	55							12.1	Pass	97	Pass	125.4	Pass	140.6									L-OCF-TBL4-5-HC-27	1.1 x 10^{-8}	Pass	11.2	121.2
	6	final	417	35							11.9	Pass	98	Pass	125.5	Pass	140.4													
	6	final	418	75							11.7	Pass	97	Pass	124.9	Pass	139.5													
	6	final	419	55							11.5	Pass	99	Pass	127.2	Pass	141.8						L-OCF-TBL4-5 WC-53	11.1	-0.4					

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Soil / Bentonite - Field																		*Soil / Bentonite - Lab*												
Date	Location (Panel and Direction)	Lift No.	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	Required Visual Checks (1 per Panel/Lift)	No. of Cycles for Each Panel/Lift	Equip. Type for Each Panel/Lift	Equip. Weight with Vibration (lbs)	Equip. Weight without Vibration (lbs)	Water Content Percent - Nuclear (5 per Acre/Lift)	Pass/Fail (<3% from Average Standard Compaction Opt. Moist Range of 11.2 - 14.2% and no below 9.2%)	Percent Compaction - Nuclear (5 per Acre/Lift)	Pass/ Fail (<3% below 95%)	Dry Density - Nuclear (pcf) (5 per Acre/Lift)	Pass/Fail (<3% with no <5 pcf of value identified as 122 pcf (117 pcf)	Wet Density - Nuclear (pcf)	Sample No. for Density - Sand Cone (1 per 20 Nuclear)	Dry Density- Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Dry Density (pcf)	Wet Density- Sand Cone (pcf)	Difference Between Sand Cone and Nuclear Wet Density (pcf)	Sample No. for Water Content - Oven (1 per 10 Nuclear)	Water Content Percent - Oven	Difference Between Oven and Nuclear Water Content (%)	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec)	Pass/ Fail (<5% > $5x10^{-7}$ cm/sec)	Moisture Content (%)	Dry Density (pcf)
	7 - West	final	420	70		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	11.3	Pass	99	Pass	127.7	Pass	142.2													
	7 - West	final	421	50							11.2	Pass	97	Pass	125.3	Pass	139.3													
	7 - West	final	422	40							11.4	Pass	99	Pass	127.1	Pass	141.6													
10/7/2000	7 - East	2	423	65	423A	Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.4	Pass	91	Fail (retested)	117.6	Fail (retested)	132.2													
	7 - East	2	424	50							11.5	Pass	99	Pass	127.0	Pass	141.6													
	7 - East	2	423A	65							12.0	Pass	97	Pass	125.4	Pass	140.4									L-OCF-TBL4-5-HC-28	1.8×10^{-8}	Pass	12.1	124.6
10/8/2000																														
10/9/2000																														
########																														
########	7 - East	3	425	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.9	Pass	96	Pass	123.2	Pass	139.0													
	7 - East	3	425-1	75 (note: at 8" depth not 6")							13.9	Pass	94	Fail (outlier)	120.3	Fail (outlier)	137.1													
	7 - East	3	426	30							12.8	Pass	98	Pass	125.7	Pass	141.8													
	7 - East	3	427	75							12.6	Pass	95	Pass	122.6	Pass	138.1									L-OCF-TBL4-5-HC-29	3.8×10^{-9}	Pass	12.0	122.0
	7 - East	3	427-1	75 (note: at 8" depth not 6")							12.9	Pass	95	Pass	122.0	Pass	137.7													
	7 - East	3	428	75							13.2	Pass	96	Pass	122.9	Pass	139.1													
	7 - East	3	428-1	75 (note: at 8" depth not 6")							12.8	Pass	95	Pass	121.9	Accepted (Pass)	137.5													
########	7 - East	4	429	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.8	Pass	97	Pass	124.4	Pass	140.3	L-OCF-TBL4-5-SC-13	121.1	-3.3	135.1	-5.2	L-OCF-TBL4-5 WC-54	11.6	-1.2					
	7 - East	4	430	35							12.9	Pass	97	Pass	124.4	Pass	140.4									L-OCF-TBL4-5-HC-30	2.0×10^{-9}	Pass	11.5	126.2
	7 - East	5	431	45		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.8	Pass	95	Pass	122.1	Pass	138.8													
	7 - East	5	432	55							13.8	Pass	95	Pass	121.9	Accepted (Pass)	138.6													
########																														
########	8	1	433	75		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	13.5	Pass	97	Pass	124.1	Pass	140.9													
	8	1	434	40							13.2	Pass	97	Pass	124.1	Pass	140.4									L-OCF-TBL4-5-HC-31	1.3×10^{-9}	Pass	12.2	124.6
	8	2	435	65		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.6	Pass	97	Pass	124.2	Pass	139.8									L-OCF-TBL4-5-HC-32	3.0×10^{-8}	Pass	12.1	125.7
	8	2	436	55							12.8	Pass	96	Pass	123.2	Pass	139.0						L-OCF-TBL4-5 WC-55	12.2	-0.6					
	8	3	437	25 (note: at 4" depth not 6")		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	12.3	Pass	97	Pass	125.1	Pass	140.5													
	8	3	438	80							12.8	Pass	96	Pass	124.8	Pass	140.0													
	8	4	439	50		Yes	4	Ingersol Rand 5D-115D Pro-Pac and/or Svedala CA262PD/362PD	55000 and/or 56025	27400 and/or 32850	14.0	Pass	96	Pass	123.4	Pass	140.6													
	8	4	440	60							12.7	Pass	97	Pass	124.4	Pass	140.1													
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OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction																												
Field Tests																				Lab Tests								
Date	Location (Panel and Direction)	Lift No.	Compacted Lift Thickness (inches)	Pass/Fail (<0.6 feet or 7.2 inches)	Nuclear Test No. (note: letter indicates retested	Elevation (note: same elevation in same panel and lift	Nuclear Retest No. for Fail Tests After Additional	No. of Cycles for Each Panel/Lift	Compactor Utilized for each Panel/Lift	Compactor Weight with Vibration (lbs.)	Compactor Weight without Vibration (lbs.)	Water Content Percent - Nuclear (2 per	Pass/Fail (<3% with no >2% below running average of 3 most recent opt. moist.	Dry Density - <3% with no >5 pcf below 95% of the running average of 3 most recent: Nuclear (pcf) (2 per section/lift)	Max Dry Density	95% of Max Dry Density less 5 pcf	Pass/Fail	Percent Compaction (2 per section/lift)	Pass/Fail (<3% below 95% (rounded) with no below	Sample No. for Water Content - Oven (1 per 10 nuclear)	Water Content Percent - Oven	Percent Difference Between Oven and Field Tests	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec) (note: results in yellow indicate the	Laboratory Utilized	Pass/Fail (<5% > $5x10^{-7}$ cm/sec with no >$5 x 10^{-7}$	Moisture Content (%)	Dry Density (pcf)
5/22/2001	8	6	6.3 and 7.6	Fail (accepted)	443	60		3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.8 - Pass	122.4	128.9	117.5	Pass	95.0	Pass									
					444	30						11.0	10.8 - Pass	122.6	128.9	117.5	Pass	95.1	Pass									
5/23/2001	8	7	6.4 and 6.3	Pass	445	65		3	I-R Propac 115 padfoot roller	55000	27400	11.3	10.8 - Pass	125.4	128.9	117.5	Pass	97.3	Pass				TBL4-5-HC-33	$4.9 x 10^{-10}$	HWA	Pass	10.7	123.4
					446	40						11.8	10.8 - Pass	123.1	128.9	117.5	Pass	95.4	Pass	TBL4-5-WC-56	11.7	-0.1						
	9 and 10	1	7.4 and 3.6	Fail (regraded)																								
	9 and 10 - regrade	1	8.6 and 5.9	Fail (regraded)																								
	9 and 10 - regrade (2nd)	1	6.9 and 5.7	Pass	447	60		3	I-R Propac 115 padfoot roller	55000	27400	12.2	10.8 - Pass	122.2	128.9	117.5	Pass	94.8	Pass				TBL4-5-HC-34	$1.5 x 10^{-8}$	HWA	Pass	13.9	119.8
					448	50						11.7	10.8 - Pass	124.4	128.9	117.5	Pass	96.5	Pass									
	9 and 10	2	6.8, 6.7, and 7.6	Fail (accepted)	449	62		3	I-R Propac 115 padfoot roller	55000	27400	11.8	10.8 - Pass	122.7	128.9	117.5	Pass	95.2	Pass									
					450	52						12.7	10.8 - Pass	123.3	128.9	117.5	Pass	95.6	Pass									
	8	8	4.1 and 5.2	Pass	451	54		2	I-R Propac 115 padfoot roller	55000	27400	11.4	10.8 - Pass	127.1	128.9	117.5	Pass	98.6	Pass									
					452	40		2	I-R Propac 100 smooth roller	55000	27400	12.7	10.8 - Pass	125.2	128.9	117.5	Pass	97.1	Pass									
5/24/2001	9 and 10	3	5.6, 6.8, and 6.5	Pass	453	60		3	I-R Propac 115 padfoot roller	55000	27400	13.2	10.7 - Pass	121.8	128.5	117.1	Pass	94.8	Pass	TBL4-5-WC-57	11.8	-1.4						
					454	40	454A					13.3	10.7 - Pass	120.8	128.5	117.1	Fail (retested)	93.9	Fail (retested)									
					454A	40		1	I-R Propac 115 padfoot roller	55000	27400	12.3	10.7 - Pass	124.5	128.5	117.1	Pass	96.9	Pass									
	9 and 10	4	6.7, 6.6, 3.5	Pass	455	45		3	I-R Propac 115 padfoot roller	55000	27400	12.8	10.7 - Pass	122.5	128.5	117.1	Pass	95.3	Pass									
					456	55						13.4	10.7 - Pass	122.2	128.5	117.1	Pass	95.1	Pass				TBL4-5-HC-35	$1.4 x 10^{-8}$	HWA	Pass	12.0	123.3
5/25/2001	11	2	9.5 and 5.4	Fail (regraded)																								
	11 - regrade	2	7.08 and 5.4	Pass	457	25		3	I-R Propac 115 padfoot roller	55000	27400	13.0	10.7 - Pass	122.9	128.5	117.1	Pass	95.5	Pass	TBL4-5-WC-58	10.8	-2.2						
					458	60						13.3	10.7 - Pass	123.1	128.5	117.1	Pass	95.8	Pass									
	11	1	7.4 and 4.7	Fail (accepted)	459	22		4	I-R Propac 115 padfoot roller	55000	27400	13.5	10.7 - Pass	122.5	128.5	117.1	Pass	95.3	Pass				TBL4-5-HC-36	$6.2 x 10^{-10}$	HWA	Pass	12.4	120.2
					460	58						12.4	10.7 - Pass	124.6	128.5	117.1	Pass	97.0	Pass									
	9 and 10	5	4.1 and 4.6	Pass	461	50		3	I-R Propac 115 padfoot roller	55000	27400	12.8	10.7 - Pass	122.6	128.5	117.1	Pass	95.4	Pass									
					462	50						12.6	10.7 - Pass	122.9	128.5	117.1	Pass	95.7	Pass									
5/30/2001	9 and 10	6	3.5, 6.25, and 4.96	Pass	463	40		3	I-R Propac 115 padfoot roller	55000	27400	11.6	10.7 - Pass	123.0	128.5	117.1	Pass	95.7	Pass	TBL4-5-WC-59	10.5	-1.1						
					464	60						12.8	10.7 - Pass	123.2	128.5	117.1	Pass	95.9	Pass									
	11	2			465	62		3	I-R Propac 115 padfoot roller	55000	27400	12.2	10.7 - Pass	125.6	128.5	117.1	Pass	97.8	Pass									
5/31/2001	9 and 10	7	3.1, 3.4, and 3.37	Pass	466	35		5	I-R Propac 100 smooth roller	55000	27400	11.9	10.7 - Pass	123.3	128.5	117.1	Pass	96.3	Pass									
					467	55	467A					12.3	10.7 - Pass	119.3	128.5	117.1	Fail (retested)	92.8	Fail (retested)									
	11	3	6.8 and 5.6	Pass	468	55		3	I-R Propac 115 padfoot roller	55000	27400	10.9	10.7 - Pass	126.0	128.5	117.1	Pass	98.1	Pass									
					469	35						10.8	10.7 - Pass	126.8	128.5	117.1	Pass	98.6	Pass									
	9 and 10	7			467A	55		3	I-R Propac 115 padfoot roller	55000	27400	12.3	10.7 - Pass	123.4	128.5	117.1	Pass	96.0	Pass	TBL4-5-WC-60	11.8	-0.5						
	12 south	1	5.7, 6.1, and 5.5	Pass	470	25		3	I-R Propac 115 padfoot roller	55000	27400	12.5	10.7 - Pass	121.5	128.5	117.1	Pass	94.5	Pass									
	12 south	2	6.6, 6, and 5.5	Pass	471	26		3	I-R Propac 115 padfoot roller	55000	27400	11.5	10.7 - Pass	124.3	128.5	117.1	Pass	96.7	Pass									
	12 south	1			472	60						12.5	10.7 - Pass	124.7	128.5	117.1	Pass	97.0	Pass									
	12 south	2			473	61						11.4	10.7 - Pass	125.7	128 5	117.1	Pass	97.8	Pass									
6/1/2001	12 south	3	3.4, 2.3, and 2.6	Pass	474	65	474A	6	I-R Propac 115 padfoot roller	55000	27400	13.9	10.7 - Pass	118.5	128.5	117.1	Fail (retested)	92.2	Fail (retested)	TBL4-5-WC-61	13.3	-0.6						
					475	30						12.1	10.7 - Pass	123.4	128.5	117.1	Pass	96.0	Pass									
	11	4	7 and 5.4	Pass	476	35		3	I-R Propac 115 padfoot roller	55000	27400	12.1	10.7 - Pass	124.8	128.5	117.1	Pass	97.1	Pass									
					477	45						12.4	10 7 - Pass	124.5	128.5	117.1	Pass	96.8	Pass									
	12 south	3			474A	65	474B	3	I-R Propac 115 padfoot roller	55000	27400	13 8	10.7 - Pass	118.4	128.5	117.1	Fail (retested)	92.1	Fail (retested)									
6/4/2001	12 south	3			474B	65		9	I-R Propac 115 padfoot roller	55000	27400	12.1	10.7 - Pass	122.6	128.5	117.1	Pass	95 3	Pass									
					475A	30						12.1	10 7 - Pass	126.0	128.5	117.1	Pass	98.0	Pass	TBL4-5-WC-62	10.5	-1.6	TBL4-5-HC-37	$1.5 x 10^{-8}$	HWA	Pass	10.5	122.7
	11	5	3.8 and 2.2	Pass	478	40		3	I-R Propac 115 padfoot roller	55000	27400	12.0	10.7 - Pass	124.9	128.5	117.1	Pass	97.2	Pass									
					479	55						12.6	10.7 - Pass	123.1	128.5	117.1	Pass	95.7	Pass									
	12 south	4	6.2, 6.8, and 3.8	Pass	480	20	480A	7	I-R Propac 115 padfoot roller	55000	27400	13.8	10.7 - Pass	119.2	128.5	117.1	Fail (retested)	92.7	Fail (retested)									
					480A	20	480B					13.1	10.7 - Pass	121.0	128.5	117.1	Fail (retested)	94.1	Fail (retested)									
					480B	20	480C					13.1	10.7 - Pass	119.0	128.5	117.1	Fail (retested)	92.6	Fail (retested)	TBL4-5-WC-63	11.6	-1.5						
6/7/2001	11	6	4.1 and 4.2	Pass	481	65		3	I-R Propac 115 padfoot roller	55000	27400	12.5	10.7 - Pass	123.6	128.5	117.1	Pass	96.2	Pass									
					482	30						11.9	10.7 - Pass	122 5	128.5	117.1	Pass	95.3	Pass	TBL4-5-WC-64	11.4	-0.5						
	12 south	4			480C	20		3	I-R Propac 115 padfoot roller	55000	27400	12.7	10.7 - Pass	123.3	128.5	117.1	Pass	95.9	Pass				TBL4-5-HC-38	$1.4 x 10^{-8}$	Soil Tech.	Pass	12	123.2
					483	55						12.3	10.7 - Pass	124.0	128.5	117.1	Pass	96.5	Pass									
	11	7	4.3 and 2.4	Pass	484	25		3	I-R Propac 115 padfoot roller	55000	27400	12.1	10.7 - Pass	123 8	128.5	117.1	Pass	96.3	Pass									
					485	60						11.1	10.7 - Pass	126 5	128.5	117.1	Pass	98.4	Pass									
	12 south	5	2.5, 6.4, and 2.6	Pass	486	40	486A	6	I-R Propac 115 padfoot roller	55000	27400	13.5	10.7 - Pass	119 6	128.5	117.1	Fail (retested)	93.1	Fail (retested)									
					486A	40						12.7	10.7 - Pass	121.8	128.5	117.1	Pass	94.7	Pass									
					487	70						12.4	10.7 - Pass	123.4	128.5	117.1	Pass	96.0	Pass									
	11	8	4.6 and 7.1	Pass	488	70		3	I-R Propac 115 padfoot roller	55000	27400	11.3	10.7 - Pass	122.4	128.5	117.1	Pass	95.3	Pass	TBL4-5-WC-65	12.1	+0.8						
					489	40						11.4	10.7 - Pass	124.9	128.5	117.1	Pass	97.2	Pass				TBL4-5-HC-39	$2.9 x 10^{-8}$	Soil Tech.	Pass	11	120.7
6/8/2001	12 south	6	3.7, 3.5, and 4.8	Pass	490	45	490A	6	I-R Propac 115 padfoot roller	55000	27400	12.0	10.7 - Pass	120.7	128.5	117.1	Fail (retested)	93.9	Fail (retested)									
					490A	45						12.4	10.7 - Pass	122.3	128.5	117.1	Pass	95.2	Pass	TBL4-5-WC-66	10.8	-1.6						
					491	65						12.5	10.7 - Pass	121.6	128.5	117.1	Pass	94.6	Pass									
	11	9	4.1 and 4.8	Pass	492	60		3	I-R Propac 100 smooth roller	55000	27400	11.8	10.7 - Pass	122.4	128.5	117.1	Pass	95.2	Pass									
					493	40						10.7	10.7 - Pass	124 9	128.5	117.1	Pass	97.1	Pass									
	12 south	7	3.8, 6.2, and 4.8	Pass	494	20		3	I-R Propac 115 padfoot roller	55000	27400	11.5	10.7 - Pass	122.9	128.5	117.1	Pass	95.6	Pass									
					495	70						11.4	10.7 - Pass	121.7	128.5	117.1	Pass	94.7	Pass									
6/13/2001	12 south	8	3.96, 4.08, and 3.12	Pass	496	55		3	I-R Propac 115 padfoot roller	55000	27400	11.4	10.5 - Pass	126.2	126.2	114.9	Pass	100.0	Pass									
					497	40						10.8	10.5 - Pass	125.0	126.2	114.9	Pass	99.0	Pass	TBL4-5-WC-67	10.4	-0.4						
					498	20						11.4	10.5 - Pass	123.1	126.2	114.9	Pass	97.5	Pass									
	12 south	9	6.84, 2.64, and 3.84	Pass	499	65		2	I-R Propac 115 padfoot roller	55000	27400	11.3	10.5 - Pass	126 3	126.2	114.9	Pass	100.0	Pass									
					500	40		2	I-R Propac 100 smooth roller	55000	27400	11.8	10.5 - Pass	121.9	126.2	114.9	Pass	96.6	Pass									
6/14/2001	12 north	1	12.48, 7.44, and 3.92	Fail (regraded)																								
	12 north -regrade	1	4.08, 7.44, and 3.84	Pass	501	28		3	I-R Propac 115 padfoot roller	55000	27400	10 8	10.5 - Pass	125.3	126.2	114.9	Pass	99.3	Pass									
					502	65						12.2	10.5 - Pass	124.4	126.2	114.9	Pass	98.5	Pass	TBL4-5-WC-68	11.2	-1						
	12 north	2	8.52 and 5.16	Fail (regraded)																								
	12 north -regrade	2	5.88 and 4.08	Pass	503	30		3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	126.7	126.2	114 9	Pass	100.4	Pass									
					504	63						11.3	10.5 - Pass	126.0	126 2	114.9	Pass	99.8	Pass									
	12 north	3	7.20 and 3.36	Pass	505	45		3	I-R Propac 115 padfoot roller	55000	27400	11.6	10 5 - Pass	124.8	126.2	114.9	Pass	98.8	Pass									
					506	55						11.5	10.5 - Pass	122.9	126.2	114.9	Pass	97.4	Pass									
6/15/2001	12 north	4	2.17 and 6.00	Pass	507	25		3	I-R Propac 115 padfoot roller	55000	27400	11.7	10.5 - Pass	126.2	126.2	114.9	Pass	100.0	Pass									
					508	45						12.6	10.5 - Pass	124.0	126.2	114.9	Pass	98.2	Pass	TBL4-5-WC-69	11.1	-1.5						
	13	1	6 12, 6.12, 6.00, 7.2, 3.48, and 6.36	Pass	509	70		5	I-R Propac 115 padfoot roller	55000	27400	11.7	10.5 - Pass	125.4	126.2	114.9	Pass	99.3	Pass									
					510	30						11.6	10.5 - Pass	122.8	126.2	114.9	Pass	97.6	Pass									
	13	2	>7.2, 4.8, 3.48, 3.36, 3.24, and 2.52	Fail (regraded)																								

	13 - regraded	2	6.96, 4.8, 3.48	Pass	511	70		3	I-R Propac 115 padfoot roller	55000	27400	invalid reading		invalid reading				invalid reading										
			3.36, 3.24, and 2.52		512	32						13.0	10.5 - Pass	123.6	126.2	114.9	Pass	97.9	Pass									
					513	70						10.9	10.5 - Pass	126.4	126.2	114.9	Pass	100.1	Pass				TBL4-5-HC-40	1.3×10^{-8}	Soil Tech.	Pass	11	120.7
	12 north	5	1.94 and 4.32	Pass	514	30		3	I-R Propac 115 padfoot roller	55000	27400	11.6	10.5 - Pass	123.3	126.2	114.9	Pass	97.7	Pass									
					515	65						11.1	10.5 - Pass	121.9	126.2	114.9	Pass	96.6	Pass									
6/18/2001	13	3	2.88, 3.84, 2.88,	Pass	516	35		3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	120.8	126.2	114.9	Pass	95.7	Pass									
			5.64, 4.08, and 3.48		517	50						10.5	10.5 - Pass	125.5	126.2	114.9	Pass	99.4	Pass	TBL4-5-WC-70	9.9	-0.6						
	12 north	6	3.12 and >7.2	Fail (regraded)																								
	12 north -regrade	6	3.12 and >7.2	Fail (regraded)																								
	12 north -regrade (2nd)	6	3.12 and 5.76	Pass	518	25		3	I-R Propac 115 padfoot roller	55000	27400	10.5	10.5 - Pass	123.3	126.2	114.9	Pass	97.6	Pass									
					519	60						10.6	10.5 - Pass	125.8	126.2	114.9	Pass	99.7	Pass									
	13	4	3.24, 4.32, 5.59,	Pass	520	60		3	I-R Propac 115 padfoot roller	55000	27400	10.6	10.5 - Pass	120.4	126.2	114.9	Pass	95.4	Pass									
			2.39, 2.28, and 4.45		521	37						10.9	10.5 - Pass	122.0	126.2	114.9	Pass	96.7	Pass									
	12 north	7	3.99 and 6.04	Pass	522	35		3	I-R Propac 115 padfoot roller	55000	27400	10.5	10.5 - Pass	122.8	126.2	114.9	Pass	97.2	Pass									
					523	55						11.6	10.5 - Pass	120.4	126.2	114.9	Pass	95.3	Pass									
6/19/2001	13	5	>7.2, 5.47, >7.2	Fail (regraded)																								
			4.92, 6.36, 5.81																									
	13 - regrade	5	>7.2, 5.47, 6.84	Fail (regraded)																								
			4.92, 6.36, 5.81																									
	13 - regrade (2nd)	5	7.07, 5.47, 6.84	Pass	524	20		3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	121.3	126.2	114.9	Pass	96.1	Pass				TBL4-5-HC-41	1.6×10^{-8}	Soil Tech.	Pass	10	120.9
			4.92, 6.38, 5.81		525	60						10.7	10.5 - Pass	123.4	126.2	114.9	Pass	97.8	Pass	TBL4-5-WC-71	9.3	-1.4						
	12 north	8	6.16 and 1.2	Pass	526	45		3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	121.3	126.2	114.9	Pass	96.0	Pass									
					527	65						11.0	10.5 - Pass	121.4	126.2	114.9	Pass	96.2	Pass				TBL4-5-HC-42	1.7×10^{-8}	Soil Tech.	Pass	10	117.3
	13	6	1.32, 7.20, 4.33,	Pass	528	55		3	I-R Propac 115 padfoot roller	55000	27400	10.9	10.5 - Pass	121.6	126.2	114.9	Pass	96.3	Pass				TBL4-5-HC-43	2×10^{-9}	HWA	Pass	10.2	121.57
			3.53, 6.95, and 3.99		529	40						10.6	10.5 - Pass	122.0	126.2	114.9	Pass	96.6	Pass									
6/20/2001	12 north	9	4.9 and 5.36	Pass	530	35		1	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	126.4	126.2	114.9	Pass	100.1	Pass									
					531	65		2	I-R Propac 100 smooth roller	55000	27400	11.1	10.5 - Pass	125.2	126.2	114.9	Pass	99.1	Pass	TBL4-5-WC-72	9.9	-1.2						
	13	7	4.92, 2.04, 3.98,	Pass	532	30		3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	124.9	126.2	114.9	Pass	99.0	Pass									
			4.92, 1.92. And 4.33		533	50						10.5	10.5 - Pass	123.2	126.2	114.9	Pass	97.5	Pass									
	13	8	3.99, 5.13, 7.07,	Pass	534	20		3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.5 - Pass	124.0	126.2	114.9	Pass	98.2	Pass									
			1.94, 1.71, and 3.08		535	65						11.4	10.5 - Pass	123.3	126.2	114.9	Pass	97.7	Pass									
6/21/2001	13	9	6.24, 1.32, 2.40,	Pass	536	50		3	I-R Propac 115 padfoot roller	55000	27400	11.0	10.5 - Pass	126.7	126.2	114.9	Pass	100.4	Pass									
			3.31, 4.22, and 1.03		537	60						11.4	10.5 - Pass	120.6	126.2	114.9	Pass	95.5	Pass	TBL4-5-WC-73	10	-1.4						
	13 south							2	I-R Propac 100 smooth roller	55000	27400																	
	13 north	10	4.22, 6.73, and 5.93	Pass	538	35		2	I-R Propac 115 padfoot roller	55000	27400	11.0	10.5 - Pass	126.6	126.2	114.9	Pass	100.3	Pass									
					539	65		2	I-R Propac 100 smooth roller	55000	27400	11.2	10.5 - Pass	124.6	126.2	114.9	Pass	98.7	Pass									
6/22/2001	14	1	>7.2, 4.33, >7.2, >7.2	Fail (regraded)																								
	14 - regrade	1	>7.2, 4.33, 6.84, >7.2	Fail (regraded)																								
	14 - regrade (2nd)	1	5.13, 4.33, 6.84, 6.04	Pass	540	45		3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	125.4	126.2	114.9	Pass	99.3	Pass									
					541	55						10.7	10.5 - Pass	122.1	126.2	114.9	Pass	96.7	Pass	TBL4-5-WC-74	9.3	-1.4						
	14	2	4.79, 6.61, 5.02, 5.02	Pass	542	47		3	I-R Propac 115 padfoot roller	55000	27400	11.0	10.5 - Pass	124.9	126.2	114.9	Pass	99.0	Pass									
					543	57						10.9	10.5 - Pass	121.3	126.2	114.9	Pass	96.1	Pass									
	14	3	4.01, 5.64, 6.04, 1.94	Pass	544	65		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	120.6	126.2	114.9	Pass	95.6	Pass									
					545	35						10.7	10.5 - Pass	122.2	126.2	114.9	Pass	96.8	Pass				TBL4-5-HC-44	1.3×10^{-8}	Soil Tech.	Pass	9	120.2
	14	4	6.16, 4.9, 6.27, 3.76	Pass	546	30	546A	3	I-R Propac 115 padfoot roller	55000	27400	9.9	10.5 - Fail (retested)	125.9	126.2	114.9	Pass	99.7	Pass									
					547	65	547A					9.7	10.5 - Fail (retested)	129.7	126.2	114.9	Pass	102.8	Pass									
6/25/2001	14	4			547A	65		1	I-R Propac 115 padfoot roller	55000	27400	10.5	10.5 - Pass	126.7	126.2	114.9	Pass	100.4	Pass									
					546A	30						11.0	10.5 - Pass	127.0	126.2	114.9	Pass	100.7	Pass									
6/26/2001	14	5	6.6, 3.53, 6.27, 6.73	Pass	548	60		3	I-R Propac 115 padfoot roller	55000	27400	11.3	10.5 - Pass	124.8	126.2	114.9	Pass	98.9	Pass									
					549	55						12.6	10.5 - Pass	123.1	126.2	114.9	Pass	97.5	Pass	TBL4-5-WC-75	11.3	-1.3						
	14	6	3.36, >7.2, 6.61, 4.45	Fail (regraded)																								
	14 - regrade	6	3.36, >7.2, 6.61, 4.45	Fail (regraded)																								
	14 - regrade (2nd)	6	3.36, 6.61, 6.61, 4.45	Pass	550	65		3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	121.6	126.2	114.9	Pass	96.3	Pass									
					551	45						12.1	10.5 - Pass	123.0	126.2	114.9	Pass	97.4	Pass				TBL4-5-HC-45	1.2×10^{-10}	HWA	Pass	11.2	122.29
6/29/2001	14	7	4.08, 4.92, 4.68, 5.24	Pass	554	35		3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	122.3	126.2	114.9	Pass	96.8	Pass									
					555	65						10.5	10.5 - Pass	128.6	126.2	114.9	Pass	101.9	Pass	TBL4-5-WC-76	9.7	-0.8						
	7 east	7	3.88, 5.02, >7.2, 3.42,	Fail (regraded)																								
			6.27, 3.88																									
	7 east - regrade	7	3.88, 5.02, 7.18, 3.42,	Pass	556	30		3	I-R Propac 115 padfoot roller	55000	27400	11.4	10.5 - Pass	124.5	126.2	114.9	Pass	98.6	Pass									
			6.27, 3.88		557	55						10.8	10.5 - Pass	124.1	126.2	114.9	Pass	98.3	Pass									
	14	8	3.65, 6.04, 2.17, 2.96	Pass	558	55		2	I-R Propac 115 padfoot roller	55000	27400	10.9	10.5 - Pass	126.6	126.2	114.9	Pass	100.3	Pass									
					559	45		2	I-R Propac 100 smooth roller	55000	27400	11.7	10.5 - Pass	125.3	126.2	114.9	Pass	99.2	Pass									
7/3/2001	7 east	8	3.72, 2.85, 2.99	Pass	561	50		3	I-R Propac 115 padfoot roller	55000	27400	11.0	10.5 - Pass	125.6	126.2	114.9	Pass	99.5	Pass									
			2.59, 2.65, and 3.2		562	65						11.3	10.5 - Pass	123.8	126.2	114.9	Pass	98 0	Pass	TBL4-5-WC-77	9.3	-2						
	6	6	3.27, 3.06, 2.76,	Pass	563	30		3	I-R Propac 115 padfoot roller	55000	27400	12.4	10.5 - Pass	124.1	126.2	114.9	Pass	98.3	Pass									
			2.87, 2.54, and 2.75		564	70						12.3	10.5 - Pass	125.3	126.2	114.9	Pass	99.3	Pass									
7/5/2001	7 east	9	3.8, 3.06, 3.05,	Pass	565	30		3	I-R Propac 115 padfoot roller	55000	27400	10.6	10.5 - Pass	123.5	126.2	114.9	Pass	97.8	Pass									
			2.83, 2.83, and 3.19		566	40						11.6	10.5 - Pass	121.3	126.2	114.9	Pass	96.1	Pass									
7/6/2001	7 east	10	3.19, 3.73, 3.27,	Pass	567	35		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	123.5	126.2	114.9	Pass	97.9	Pass									
			3.26, 3.29, and 3.43		568	25						10.7	10.5 - Pass	127.4	126.2	114.9	Pass	100.9	Pass	TBL4-5-WC-78	9.9	-0.8						
7/9/2001	6	7	>7.2, 3.15, 2.81	Fail (regraded)																								
			3.6, 3.49, 3.1																									
	6 - regraded	7	>7.2, 3.15, 2.81	Fail (regraded)																								
			3.6, 3.49, 3.1																									
	6 - regraded (2nd)	7	3.14, 3.15, 2.81	Pass	569	50		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	125.9	126.2	114.9	Pass	99.8	Pass									
			3.6, 3.49, 3.1		570	70		2	I-R Propac 100 smooth roller	55000	27400	11.1	10.5 - Pass	126.3	126.2	114.9	Pass	100.1	Pass	TBL4-5-WC-79	9.7	-1.4						
	LCRS Sump	2	5.28	Pass	577	8		3	I-R Propac 115 padfoot roller	55000	27400	12.4	10.8 - Pass	122.6	128.5	122.0	Pass	95.4	Pass									
	LCRS Sump	1	5.28	Pass	578	7.5		3	I-R Propac 115 padfoot roller	55000	27400	10.9	10.8 - Pass	127.6	128.5	122.0	Pass	99.3	Pass									
	LCRS Sump	3	5.28	Pass	579	8.5		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.8 - Pass	122.1	128.5	122.0	Pass	95.0	Pass	TBL4-5-WC-80	9.7	-1.1						
7/10/2001	LCRS Sump	4	6	Pass	580	9		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.8 - Pass	126.4	128.5	122.0	Pass	98 3	Pass									
	15	1	6.5, 5.47	Pass	581	50		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	124.6	126.2	114.9	Pass	98.7	Pass	TBL4-5-WC-81	7.9	-2.9						
					582	60						10.8	10 5 - Pass	126.3	126.2	114.9	Pass	100.0	Pass									
	15	2	5.13, 3.99	Pass	583	52		3	I-R Propac 115 padfoot roller	55000	27400	10.9	10.5 - Pass	123.2	126.2	114.9	Pass	97.6	Pass				TBL4-5-HC-46	3.2×10^{-8}	HWA	Pass	12.9	120
					584	62						10.6	10.5 - Pass	127.0	126.2	114.9	Pass	100.6	Pass									
	LCRS Sump	5	3.72	Pass	585	9.4		3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.8 - Fail (outlier)	125.3	128.5	122 0	Pass	97.5	Pass									
	LCRS Sump	6	4.2	Pass	586	9.7		3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.8 - Pass	123.4	128.5	122.0	Pass	96.0	Pass									
	LCRS Sump	7	4.2	Pass	587	10		3	I-R Propac 115 padfoot roller	55000	27400	11.0	10.8 - Pass	128.6	128.5	122.0	Pass	100.1	Pass									
	21 (subgrade at bottom)	NA	-	-	588	10		-	-	-	-	6.2	-	126.4	132.0	-	-	95.8	-									
	21 (bottom)	1	5.76, 2.64, 6.72	Pass	592	13.5		3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	126.1	126.2	114.9	Pass	99.9	Pass									
					593	13						10.5	10.5 - Pass	124.0	126.2	114.9	Pass	98.2	Pass									
	21 (bottom)	2	9.6, 5.16, 7.68	Fail (regraded)																								

	21 (bottom) - regraded	2	8.78, 5.16, 4.68	Fail (regraded)																							
	21 (bottom) - regraded (2nd)	2	8.28, 5.16, 4.68	Fail (regraded)																							
	21 (bottom) - regraded (3rd)	2	5.04, 5.16, 4.68	Pass	594	14.2	3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.5 - Pass	124.7	126.2	114.9	Pass	98.8	Pass									
					595	13.5					10.8	10.5 - Pass	128.4	126.2	114.9	Pass	101.7	Pass									
7/11/2001	16 (subgrade)	NA	-	-	596	70	-	-	-	-	4.2	-	124.2	133.5	-	-	93.0	-									
	15	3	3.53, 3.65	Pass	597	55	3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.5 - Pass	125.2	126.2	114.9	Pass	99.1	Pass	TBL4-5-WC-83	10	-1.1						
					598	75					11.2	10.5 - Pass	125.9	126.2	114.9	Pass	99.7	Pass									
	21 (bottom)	3	3.48, 5.64, 5.52	Pass	599	11.8	3	I-R Propac 115 padfoot roller	55000	27400	11.8	10.5 - Pass	125.2	126.2	114.9	Pass	99.2	Pass									
					600	15					10.7	10.5 - Pass	126.9	126.2	114.9	Pass	100.5	Pass									
	21 (bottom)	4	4.2, 4.56, 4.56	Pass	605	15	3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	122.5	126.2	114.9	Pass	97.1	Pass									
					606	15					11.9	10.5 - Pass	125.1	126.2	114.9	Pass	99.1	Pass									
	21 (bottom)	5	5.88, 5.16, 7.08	Pass	607	17	3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	126.0	126.2	114.9	Pass	99.8	Pass									
					608	15					11.5	10.5 - Pass	126.1	126.2	114.9	Pass	99.9	Pass				TBL4-5-HC-47	5×10^{-8}	Soil Tech.	Pass	12	125.9
	21 (bottom)	6	3.48, 4.32, 3.36	Pass	610	13	3	I-R Propac 115 padfoot roller	55000	27400	12.2	10.5 - Pass	120.8	126.2	114.9	Pass	95.7	Pass				TBL4-5-HC-48	1×10^{-8}	Soil Tech.	Pass	10	121.8
					611	15					10.8	10.5 - Pass	125.7	126.2	114.9	Pass	99.6	Pass	TBL4-5-WC-84	9.7	-1.1						
7/12/2001	21 (bottom)	7	3.72, 4.44, 5.64	Pass	612	14	3	I-R Propac 115 padfoot roller	55000	27400	11.0	10.5 - Pass	125.3	126.2	114.9	Pass	99.3	Pass									
					613	16					10.6	10.5 - Pass	127.1	126.2	114.9	Pass	100.6	Pass	TBL4-5-WC-85	8.6	-2						
	15	4	9, 5.4	Fail (regraded)																							
	15 - regraded	4	4.1, 4.33	Pass	614	50	3	I-R Propac 115 padfoot roller	55000	27400	10.5	10.5 - Pass	125.5	126.2	114.9	Pass	99.4	Pass									
					615	70					10.7	10.5 - Pass	121.9	126.2	114.9	Pass	96.6	Pass									
	21 (bottom)	8	1.08, 4.32, 2.88	Pass	616	16	3	I-R Propac 115 padfoot roller	55000	27400	10.8	10.5 - Pass	127.1	126.2	114.9	Pass	100.7	Pass									
					617	16					11.8	10.5 - Pass	123.5	126.2	114.9	Pass	97.8	Pass									
	LCRS Sump	8	same as panel 21, lift 1	Pass	618	13.1	3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	123.9	126.2	114.9	Pass	98.2	Pass									
	LCRS Sump	9	same as panel 21, lift 2	Pass	619	13.6	3	I-R Propac 115 padfoot roller	55000	27400	12.2	10.5 - Pass	125.0	126.2	114.9	Pass	99.0	Pass									
	LCRS Sump	10	same as panel 21, lift 3	Pass	620	14.1	3	I-R Propac 115 padfoot roller	55000	27400	11.5	10.5 - Pass	124.8	126.2	114.9	Pass	98.9	Pass									
	LCRS Sump	11	same as panel 21, lift 4	Pass	621	14.5	3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	123.7	126.2	114.9	Pass	98.0	Pass									
	LCRS Sump	12	same as panel 21, lift 5	Pass	622	14.9	3	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	128.6	126.2	114.9	Pass	101.9	Pass	TBL4-5-WC-86	8.6	-2.1						
7/13/2001	15	5	7.4, 6.84	Fail (regraded)																							
	15 - regraded	5	7.5, 6.84	Fail (regraded)																							
	15 - regraded (2nd)	5	6.96, 6.84	Pass	626	60	3	I-R Propac 115 padfoot roller	55000	27400	11.4	10.5 - Pass	125.7	126.2	114.9	Pass	99.6	Pass									
					627	65					10.9	10.5 - Pass	121.0	126.2	114.9	Pass	95.8	Pass	TBL4-5-WC-87	10.1	-0.8						
	17 (access road)	1	5.64, 1.56, 4.2	Pass	too thin to test	-	-	-	-	-	-	-	-	-	-	-	-	-									
	17 (access road)	2	3.96, 3.72, 4.32	Pass	628	20	3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.5 - Pass	125.2	126.2	114.9	Pass	99.8	Pass									
	17 (access road)	3	4.32, 1.2	Pass	629	25	3	I-R Propac 115 padfoot roller	55000	27400	12.2	10.5 - Pass	123.0	126.2	114.9	Pass	97.4	Pass									
	17 (access road)	4	1.44, 2.16	Pass	630	18	3	I-R Propac 115 padfoot roller	55000	27400	12.7	10.5 - Pass	122.5	126.2	114.9	Pass	97.1	Pass									
	17 (access road)	5	5.16, 5.76	Pass	631	25	3	I-R Propac 115 padfoot roller	55000	27400	13.2	10.5 - Pass	119.6	126.2	114.9	Pass	94.8	Pass									
	17 (access road)	6	4.68, 5.4	Pass	632	16	3	I-R Propac 115 padfoot roller	55000	27400	11.8	10.5 - Pass	124.0	126.2	114.9	Pass	98.2	Pass									
	17 (access road)	7	4.92, 3.12	Pass	633	20	3	I-R Propac 115 padfoot roller	55000	27400	11.7	10.5 - Pass	122.4	126.2	114.9	Pass	96.9	Pass	TBL4-5-WC-88	11	-0.7						
	17 (access road)	8	3.36, 7.32	Fail (accepted)	634	28	3	I-R Propac 115 padfoot roller	55000	27400	11.3	10.5 - Pass	122.8	126.2	114.9	Pass	97.3	Pass									
7/17/2001	17 (access road)	9	0.6, 1.92	Pass	635	25	3	I-R Propac 115 padfoot roller	55000	27400	11.6	10.5 - Pass	127.8	126.2	114.9	Pass	101.3	Pass									
	21 (bottom)	9	6, 0.12, 5.28	Pass	636	16.5	2	I-R Propac 115 padfoot roller	55000	27400	10.7	10.5 - Pass	128.3	126.2	114.9	Pass	101.7	Pass	TBL4-5-WC-89	8.6	-2.1						
					637	14.5	2	I-R Propac 100 smooth roller	55000	27400	12.3	10.5 - Pass	127.2	126.2	114.9	Pass	100.8	Pass									
	15	6	3.84, 5.28	Pass	638	53	3	I-R Propac 115 padfoot roller	55000	27400	12.4	10.5 - Pass	122.4	126.2	114.9	Pass	97.0	Pass									
					639	75					10.6	10.5 - Pass	124.2	126.2	114.9	Pass	98.3	Pass									
	17 (access road)	10	6.6, 7.44	Fail (regraded)																							
	17 (access road) - regraded	10	6.6, 6.6	Pass	640	28	3	I-R Propac 115 padfoot roller	55000	27400	11.4	10.5 - Pass	126.7	126.2	114.9	Pass	102.0	Pass									
							2	I-R Propac 100 smooth roller	55000	27400																	
	15	7	3, 3.84	Pass	641	55	3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.5 - Pass	127.2	126.2	114.9	Pass	100.8	Pass									
					642	75					11.8	10.5 - Pass	125.0	126.2	114.9	Pass	99.0	Pass									
7/18/2001	15	8	6.36, 8	Fail (regraded)																							
	15 - regraded	8	6.36, 7.92	Fail (regraded)																							
	15 - regraded 2nd	8	6.36, 7.2	Pass	643	40	3	I-R Propac 115 padfoot roller	55000	27400	11.8	10.5 - Pass	126.4	126.2	114.9	Pass	100.1	Pass									
					644	60	2	I-R Propac 100 smooth roller	55000	27400	11.9	10.5 - Pass	127.0	126.2	114.9	Pass	100.6	Pass	TBL4-5-WC-90	10.2	-1.7						
	16	1	8.09, 7.3, 13.9	Fail (regraded)																							
	16 - regraded	1	7.18, 6.95, 9.69	Fail (regraded)																							
	16 - regraded 2nd	1	7.18, 6.95, 5.93	Pass	645	70	3	I-R Propac 115 padfoot roller	55000	27400	12.1	10.5 - Pass	125.0	126.2	114.9	Pass	99.0	Pass									
					646	75					11.8	10.5 - Pass	126.0	126.2	114.9	Pass	99.8	Pass									
	16	2	4.1, 3.3, 2.74	Pass	647	70	3	I-R Propac 115 padfoot roller	55000	27400	11.4	10.5 - Pass	126.5	126.2	114.9	Pass	100.2	Pass									
					648	76					10.9	10.5 - Pass	124.7	126.2	114.9	Pass	98.8	Pass									
7/19/2001	16	3	3.19, 3.76, 3.88	Pass	649	60	3	I-R Propac 115 padfoot roller	55000	27400	11.8	10.5 - Pass	126.4	126.2	114.9	Pass	100.1	Pass				TBL4-5-HC-49	2.7×10^{-8}	HWA	Pass	9.8	124
					650	75					11.9	10.5 - Pass	121.9	126.2	114.9	Pass	96.5	Pass	TBL4-5-WC-91	10.3	-1.6						
	16	4	2.51, 5.24, 7.18	Pass	651	78	3	I-R Propac 115 padfoot roller	55000	27400	11.8	10.5 - Pass	123.6	126.2	114.9	Pass	97.9	Pass									
					652	75					11.4	10.5 - Pass	125.4	126.2	114.9	Pass	99.3	Pass									
	16	5	3.53, 5.93, 4.9	Pass	653	55	3	I-R Propac 115 padfoot roller	55000	27400	11.6	10.5 - Pass	125.8	126.2	114.9	Pass	99.6	Pass									
					654	75					10.6	10.5 - Pass	127.4	126.2	114.9	Pass	100.9	Pass									
	16	6	3.99, 4.1, 5.47	Pass	655	70	3	I-R Propac 115 padfoot roller	55000	27400	11.1	10.5 - Pass	125.4	126.2	114.9	Pass	99.4	Pass									
					656	75					12.1	10.5 - Pass	121.3	126.2	114.9	Pass	96.1	Pass									
	16	7	5.81, 1.68, 2.96	Pass	657	70	3	I-R Propac 115 padfoot roller	55000	27400	12.4	10.5 - Pass	123.5	126.2	114.9	Pass	97.8	Pass									
					658	75					12.0	10.5 - Pass	124.0	126.2	114.9	Pass	98.2	Pass									
7/20/2001	16	8	7.52, 6.73, 6.16	Fail (regraded)																							
	16 - regraded	8	7.07, 6.73, 6.16	Pass	659	65	3	I-R Propac 115 padfoot roller	55000	27400	12.4	10.5 - Pass	124.7	126.2	114.9	Pass	98.9	Pass									
					660	70					12.8	10.5 - Pass	120.3	126.2	114.9	Pass	95.3	Pass	TBL4-5-WC-92	10.4	-2.4						
	16	9	1.82, 6.84, 3.42	Pass	661	60	3	I-R Propac 115 padfoot roller	55000	27400	11.2	10.5 - Pass	126.7	126.2	114.9	Pass	100.4	Pass									
					662	80	2	I-R Propac 100 smooth roller	55000	27400	11.4	10.5 - Pass	124.3	126.2	114.9	Pass	98.4	Pass									
8/7/2001	Bottom (over separation fabric)	1	4.92, 4.68, 5.16	Pass	see note[1]	-	2	I-R Propac 100 smooth roller	55000	27400	-	-	-	-	-	-	-	-									
8/8/2001	Bottom (over separation fabric)	2	4.32, 5.28, 4.68	Pass	see note[1]	-	2	I-R Propac 100 smooth roller	55000	27400	-	-	-	-	-	-	-	-									
		3	3.72, 3.72, 4.08	Pass	see note[1]	-	2	I-R Propac 100 smooth roller	55000	27400	-	-	-	-	-	-	-	-									

Note 1: Refer to the "Revised Installation Procedure" for the bottom secondary CSL liner. This procedure describes the rational for changing the compaction method and eliminating the nuclear gauge tests.

OCF Table 4-5. Testing of Soil Bentonite Mixture After Compaction

Date	Location (Panel and Direction)	Lift No.	Compacted Lift Thickness (inches)	Pass/Fail (<0.6 feet or 7.2 inches)	Nuclear Test No. (note: letter indicates retested location)	Elevation (note: same elevation in same panel and lift indicates same test location)	Nuclear Retest No. for Fail Tests After Additional Work Performed	No. of Cycles for Each Panel/Lift	Compactor Utilized for each Panel/Lift	Compactor Weight without Vibration (lbs.)	Water Content Percent - Nuclear (2 per section/lift)	Pass/Fail (<3% with no >2% below running average of 3 most recent opt. moist. values)	Dry Density Nuclear (pcf) (2 per section/lift)	<3% with no >5 pcf below 95% of the running average of 3 most recent maximum dry density values: Max Dry Density	<3% with no >5 pcf below 95% of the running average of 3 most recent maximum dry density values: 95% of Max Dry Density less 5 pcf	<3% with no >5 pcf below 95% of the running average of 3 most recent maximum dry density values: Pass/Fail	Percent Compaction (2 per section/lift)	Pass/Fail (<3% below 95% (rounded) with no below 90%)	Sample No. for Water Content - Oven (1 per 10 nuclear)	Water Content Percent - Oven	Percent Difference Between Oven and Field Tests	Sample No. for Shelby Tubes (1 per Acre/Lift)	Hydraulic Conductivity (cm/sec) (note: results in yellow indicate the measured inflow rate after 5 days and results in green are preliminary after 10 days)	Laboratory Utilized	Pass/ Fail (<5% > $5x10^{-7}$ cm/sec with no > 5×10^{-7} cm/sec)	Moisture Content (%)	Dry Density (pcf)
									Field Tests										Lab Tests								
8/19/2003	17 South	1	2.76, 5.28	Pass	672	40	672A	4	SAKAI Pad Foot Roller	12800	13.3	9.8 - Pass	120.6	127.7	116.3	Pass	94.0	Fail (retested)									
					673	49		4	SAKAI Pad Foot Roller	12800	13.9	9.8 - Pass	120.9	127.7	116.3	Pass	95.0	Pass									
					672A	40		4	SAKAI Pad Foot Roller	12800	13.6	9.8 - Pass	121.8	127.7	116.3	Pass	95.0	Pass									
	17 South	2	6.72, 6.36	Pass	674	35		5	SAKAI Pad Foot Roller	12800	12.5	9.8 - Pass	123.8	127.7	116.3	Pass	97.0	Pass									
					675	51		5	SAKAI Pad Foot Roller	12800	12.9	9.8 - Pass	122.9	127.7	116.3	Pass	96.0	Pass									
8/20/2003	17 South	3	7.08, 6.60	Pass	676	38		3	SAKAI Pad Foot Roller	12800	11.9	9.8 - Pass	122.9	127.7	116.3	Pass	96.0	Pass									
					677	48		3	SAKAI Pad Foot Roller	12800	13.0	9.8 - Pass	121.2	127.7	116.3	Pass	95.0	Pass	TBL4-5-WC-93	10.8	-2.2						
	17 South	4	4.44, 5.40	Pass	678	35		3	SAKAI Pad Foot Roller	12800	13.3	9.8 - Pass	122.8	127.7	116.3	Pass	96.0	Pass									
					679	51		3	SAKAI Pad Foot Roller	12800	11.9	9.8 - Pass	125.3	127.7	116.3	Pass	98.0	Pass									
	17 South	5	6.00, 5.88	Pass	680	37	680A	5	SAKAI Pad Foot Roller	12800	14.2	9.8 - Pass	119.7	127.7	116.3	Pass	94.0	Fail (retested)									
					681	48		5	SAKAI Pad Foot Roller	12800	12.8	9.8 - Pass	124.2	127.7	116.3	Pass	97.0	Pass									
					680A	37		5	SAKAI Pad Foot Roller	12800	13.6	9.8 - Pass	122.0	127.7	116.3	Pass	96.0	Pass									
	17 South	6	5.16, 4.44	Pass	682	35		3	SAKAI Pad Foot Roller	12800	11.7	9.8 - Pass	123.5	127.7	116.3	Pass	97.0	Pass									
					683	48		3	SAKAI Pad Foot Roller	12800	11.5	9.8 - Pass	125.5	127.7	116.3	Pass	98.0	Pass									
	Previously Placed CSL	-	-	-	684	40		-			12.4	9.8 - Pass	121.9	127.7	116.3	Pass	95.0	Pass									
					685	45		-			10.6	9.8 - Pass	129.3	127.7	116.3	Pass	101.0	Pass									
	17 South	7	3.11, 3.31	Pass	686	40		2	SAKAI Pad Foot Roller	12800	11.8	9.8 - Pass	126.3	127.7	116.3	Pass	98.9	Pass									
					687	50		2	SAKAI Pad Foot Roller	12800	12.2	9.8 - Pass	124.4	127.7	116.3	Pass	97.0	Pass									
8/21/2003	17 North	1	6.6, 5.2, 5.8, 4.7, 4.8*	Pass	688	77		4	SAKAI Pad Foot Roller	12800	12.5	9.8 - Pass	123.6	127.7	116.3	Pass	97.0	Pass	TBL4-5-WC-94	10.5	-2.0						
					689	65		4	SAKAI Pad Foot Roller	12800	11.3	9.8 - Pass	123.3	127.7	116.3	Pass	97.0	Pass									
	17 North	2	6.6, 5.2, 5.8, 4.7, 4.8*	Pass	690	58		3	SAKAI Pad Foot Roller	12800	11.3	9.8 - Pass	126.7	127.7	116.3	Pass	99.0	Pass									
					691	78		3	SAKAI Pad Foot Roller	12800	11.3	9.8 - Pass	125.0	127.7	116.3	Pass	98.0	Pass									
	17 North	3	6.6, 5.1, 6.5, 6.6, 4.4*	Pass	692	62		3	SAKAI Pad Foot Roller	12800	11.6	9.8 - Pass	123.0	127.7	116.3	Pass	96.0	Pass				TBL4-5-HC-50	3.4×10^{-9}	HWA	Pass	10	124.3
					693	72		3	SAKAI Pad Foot Roller	12800	12.0	9.8 - Pass	123.4	127.7	116.3	Pass	97.0	Pass									
	17 North	4	4.1, 6.9, 4.6, 4.2, 5.2*	Pass	694	60		3	SAKAI Pad Foot Roller	12800	11.3	9.8 - Pass	124.5	127.7	116.3	Pass	98.0	Pass									
					695	78		3	SAKAI Pad Foot Roller	12800	12.4	9.8 - Pass	123.3	127.7	116.3	Pass	97.0	Pass									
8/22/2003	17 North	5	6.8 and 6.6*	Pass	696	63		3	SAKAI Pad Foot Roller	12800	11.5	9.8 - Pass	123.0	127.7	116.3	Pass	96.0	Pass				TBL4-5-HC-51	6.1×10^{-9}	HWA	Pass	10.2	124.4
					697	70		3	SAKAI Pad Foot Roller	12800	11.1	9.8 - Pass	127.3	127.7	116.3	Pass	100.0	Pass									
	17 North	6	3.6, 7.2, 4.3, 3.5, 6.5*	Pass	698	65		3	SAKAI Pad Foot Roller	12800	12.0	9.8 - Pass	125.3	127.7	116.3	Pass	98.0	Pass	TBL4-5-WC-95	9.9	-2.1						
					699	78		3	SAKAI Pad Foot Roller	12800	12.1	9.8 - Pass	125.6	127.7	116.3	Pass	98.0	Pass									
	17 North	7	6, 7.2*	Pass	700	60		3	SAKAI Pad Foot Roller	12800	11.4	9.8 - Pass	125.7	127.7	116.3	Pass	98.0	Pass									
					701	65		3	SAKAI Pad Foot Roller	12800	11.9	9.8 - Pass	123.3	127.7	116.3	Pass	97.0	Pass									
	17 North	8	6.8, 1.1*	Pass	702	68		3	SAKAI Pad Foot Roller	12800	11.0	9.8 - Pass	128.9	127.7	116.3	Pass	101.0	Pass									
					703	72		3	SAKAI Pad Foot Roller	12800	11.1	9.8 - Pass	128.2	127.7	116.3	Pass	100.0	Pass									
9/2/2003	Anchor Trench	-	-	-	704	Grade		-			7.8	8.0 - Pass	127.5	134.0	122.3	Pass	95.0	Pass									
					705	Grade		-			6.0	8.0 - Pass	127.0	134.0	122.3	Pass	95.0	Pass									
					706	Grade		-			4.5	8.0 - Pass	123.9	134.0	122.3	Pass	93.0	Pass									

*GPS nonfunctional - problems caused data loss. Measurements taken manually.

OCF Table 5-1. Interface Shear Strength Tests For Liner Materials

Geocomposite/DST 60 mil BPE [1]

Test Completion Date	Material	Reference	Roll No. Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Pass/Fail (≥11.5 degrees)
8/17/2000	Geocomposite Net (TexNet 3002/1625)	Bid-56	112	407	24.7	NA	358	11.6	Pass
	60 mil BPE FML (Columbia R601)	125-00-08	620C00-16498B						

DST 60 mil BPE/Low Permeability Compacted Soil [2]

Test Completion Date	Material	Reference	Roll No. Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Pass/Fail (≥22 degrees)
8/30/2000	60 mil BPE FML (Columbia R601)	125-00-08	617D0-16434B	0	23	NA	42	20	Fail (accepted based on design re-evaluation)
	Low Permeability Soil / 8% Bentonite	Lloyd Ent. / CETCO	NA						

Geocomposite/DST 60 mil BPE/Geotextile GCL/Geocomposite/DST 60 mil BPE (GCL Hydration at 2000 psf) [3]

Test Completion Date	Material	Reference	Roll No. Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Pass/Fail (≥14.5 degrees)
9/5/2000	Geocomposite Net (TexNet 3002/1625)	Bid-56	112	0	27	NA	0	22	Pass
	60 mil BPE FML (Columbia R601)	125-00-08	617D0-16434B						
	Geotextile GCL (CETCO Bentomat)	Lot 200029L0	2643						

Geocomposite/DST 60 mil BPE/Geotextile GCL/Geocomposite/DST 60 mil BPE (GLC Hydration at 125 psf) [4]

Test Completion Date	Material	Reference	Roll No. Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (≥17.5 degrees)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Shear Stress Pass/Fail (≥500 psf)
8/30/2000	Geocomposite Net (TexNet 3002/1625)	Bid-56	112	37	18	Pass	68	13	Pass[5]
	60 mil BPE FML (Columbia R601)	125-00-08	617D0-16434B						
	Geotextile GCL (CETCO Bentomat)	Lot 200029L0	2643						

Note 1: Tested at normal stress of 1,000, 2,000, and 8,000 psf.
2: Tested at normal stress of 1,000, 2,000, 4,000, and 8, 000 psf.
3: Tested at normal stress of 2,000, 4,000, and 8,000 psf.
4: Tested at normal stress of 2,000, 4,000, and 8,000 psf.
The project plan called for testing at 1,000, 2,000, and 8,000 psf.
The change in normal stress loads does not impact the interface shear strength results.
5: Post-peak shear stress results are 579, 925, and 1,948 psf at the normal stress loads of 2,000, 4,000, and 8,000 psf respectively.

Table 5-1. Interface Shear Strength Tests For Cover Materials

Gravel Drainage Layer/16 oz. Cushion Geotextile/DST 40 mil BPE [6]

Test Completion Date	Material	Reference	Roll No. Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Pass/Fail (≥16 degrees)
7/25/2005	Biotic Layer Gravel	Glacier	NA	232	14.6	NA	181	9.2	Fail (accepted based on design re-evaluation)
	Cushion Geotextile	SI Geosynthetics	2003784635						
	40 mil BPE FML	CERROT							

DST 40 mil BPE/Geotextile GCL/3/4"minus Cushion Soil [6,7]

Test Completion Date	Material	Reference	Roll No Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Pass/Fail (≥20 degrees)
8/5/2005	40 mil BPE FML			207	20	NA	261	10.9	Fail (accepted based on design re-evaluation)
	GCL (Bentomat DN)	CETCO	3946						
	Cushion Soil	ASARCO	NA						

6 oz. Cushion Geotextile/Gravel Drainage Layer[8]

Test Completion Date	Material	Reference	Roll No. Sampled	Peak Strength: Cohesion (psf)	Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)	Post - Peak Strength: Cohesion (psf)	Post - Peak Strength: Friction Angle (degrees)	Pass/Fail (no criteria)
8/30/2000	Cushion Geotextile	SI Geosynthetics	2004621101	0	42.4	NA	0	42.7	NA
	Biotic Layer Gravel	Glacier	NA						

Note 6: Tested at normal stress of 125, 250, and 500 psf.
Note 7: CSL soil replaced with Geosynthetic Clay Liner (GCL).
Note 8: Added for re-design.

OCF Table 6-1. Quality Assurance Tests for FML

Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seams Inspected (panels)	*Destructive Tests Performed by Contractor*							*Destructive Tests Performed by Engineering Inspector*				
						Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Sample No.	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 70 lbs/in)
7/19/01	Yes	Yes	Yes (panels 1-18)	68,264	none												
7/20/01	Yes	Yes	Yes (panels 19 - 41)	84,433	P1/P2	DS-1	Field	162	Pass	A	121	Pass	DS-1	165	Pass	114	Pass
										B	118	Pass					
							Lab	178	Pass	A	134	Pass					
										B	131	Pass					
					P3/P4	DS-2	Field	160	Pass	A	111	Pass					
										B	110	Pass					
							Lab	177	Pass	A	139	Pass					
										B	142	Pass					
					P5/P5A	DS-3	Field	130	Pass	A	103	Pass	DS-3	133	Pass	111	Pass
										B	110	Pass					
							Lab	139	Pass	A	128	Pass					
										B	127	Pass					
					P7/P8	DS-4	Field	161	Pass	A	100	Pass					
										B	106	Pass					
							Lab	168	Pass	A	127	Pass					
										B	129	Pass					
					P26A/P15A	DS-5	Field			A	108	Pass	DS-5	164	Pass	121	Pass
										B	126	Pass					
							Lab	168	Pass	A	130	Pass					
										B	129	Pass					
					P5A/P18	DS-6	Field			A	104	Pass	DS-6	125	Pass	72	Fail(2)
										B	118	Pass				98	Pass
							Lab	136	Pass	A	103	Pass					
										B	103	Pass					
					P9/P23	DS-7	Field			A	124	Pass	DS-7	133	Pass	102	Pass
										B	116	Pass					
							Lab	142	Pass	A	104	Pass					
										B	115	Pass					
					P26/P27	DS-8	Field			A	121	Pass					
										B	129	Pass					
							Lab	161	Pass	A	121	Pass					
										B	122	Pass					
					P17/P17A	DS-9	Field			A	123	Pass	DS-9	122	Pass	96	Pass
										B	121	Pass					
							Lab	144	Pass	A	131	Pass					
										B	118	Pass					
					P15A/P1	DS-10	Field			A	119	Pass	DS-10	128	Pass	106	Pass
										B	121	Pass					
							Lab	144	Pass	A	116	Pass					
										B	117	Pass					
					P33/P32	DS-11	Field			A	119	Pass					
										B	127	Pass					
							Lab	169	Pass	A	126	Pass					

OCF Table 6-1. Quality Assurance Tests for FML																	
						Destructive Tests Performed by Contractor							*Destructive Tests Performed by Engineering Inspector*				
Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seams Inspected (panels)	Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Sample No.	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 70 lbs/in)
										B	141	Pass					
7/21/01	Yes	no	Yes (panel 42)	1,173	none												
7/23/01	no	no	no	none	P27/P28A	DS-12	Field			A	126	Pass					
										B	93	Pass					
							Lab	162	Pass	A	119	Pass					
										B	127	Pass					
					P15/P16	DS-13	Field			A	120	Pass	DS-13	166	Pass	127	Pass
										B	130	Pass					
							Lab	167	Pass	A	124	Pass					
										B	123	Pass					
					P38/P39	DS-14	Field			A	127	Pass					
										B	118	Pass					
							Lab	170	Pass	A	127	Pass					
										B	116	Pass					
7/24/01	Yes	No	Yes (panels 43-62)	66,838	none												
7/25/01	Yes	No	Yes (panels 63-84)	73,094	none												
7/26/01	Yes	No	Yes (panel 85)	920	P43/P43A	DS-15	Field	129	Pass	A	112	Pass	DS-15	131	Pass	98	Pass
										B	116	Pass					
							Lab	137	Pass	A	118	Pass					
										B	126	Pass					
					P46/P51	DS-16	Field	136	Pass	A	110	Pass					
										B	115	Pass					
							Lab	141	Pass	A	121	Pass					
										B	124	Pass					
					P47A/P48	DS-17	Field	154	Pass	A	106	Pass					
										B	111	Pass					
							Lab	164	Pass	A	124	Pass					
										B	116	Pass					
					P49/P55	DS-18	Field	136	Pass	A	106	Pass	DS-18	131	Pass	107	Pass
										B	112	Pass					
							Lab	144	Pass	A	118	Pass					
										B	106	Pass					
					P58/P61	DS-19	Field	136	Pass	A	114	Pass					
										B	113	Pass					
							Lab	147	Pass	A	122	Pass					
										B	124	Pass					
					P68/P29	DS-20	Field	129	Pass	A	105	Pass					
										B	103	Pass					
							Lab	149	Pass	A	122	Pass					
										B	121	Pass					
					P51/P50A	DS-21	Field	144	Pass	A	109	Pass					
										B	110	Pass					
							Lab	160	Pass	A	124	Pass					
										B	125	Pass					

OCF Table 6-1. Quality Assurance Tests for FML

Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seams Inspected (panels)	*Destructive Tests Performed by Contractor*							*Destructive Tests Performed by Engineering Inspector*				
						Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Sample No.	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 70 lbs/in)
					P66A/P67	DS-22	Field	136	Pass	A	97	Pass					
										B	92	Pass					
							Lab	147	Pass	A	112	Pass					
										B	120	Pass					
					P72/P33	DS-23	Field	133	Pass	A	103	Pass					
										B	110	Pass					
							Lab	142	Pass	A	113	Pass					
										B	116	Pass					
					P71/P72	DS-24	Field	150	Pass	A	107	Pass					
										B	115	Pass					
							Lab	163	Pass	A	130	Pass					
										B	129	Pass					
					P76/P77	DS-25	Field	118	Pass	A	105	Pass	DS-25	135	Pass	100	Pass
										B	101	Pass					
							Lab	146	Pass	A	122	Pass					
										B	114	Pass					
					P81/P82	DS-26	Field	144	Pass	A	105	Pass					
										B	109	Pass					
							Lab	161	Pass	A	124	Pass					
										B	112	Pass					
					P52/P44	DS-27	Field	131	Pass	A	117	Pass	DS-27	132	Pass	102	Pass
										B	113	Pass					
							Lab	138	Pass	A	119	Pass					
										B	119	Pass					
8/13/01	Yes	No	Yes (panels A1-A3)	6,825													
8/14/01	Yes	No	Yes (panels A3A-A7A)	14,925													
8/15/01	Yes	No	Yes (panels A8-A12)	17,980													
8/16/01	Yes	No	Yes (panels A13-A18)	21,075													
8/17/01	Yes	No	Yes (panels A19-A29)	22,955													
8/18/01	Yes	No	Yes (panels A30-A33)	19,274													
8/20/01	Yes	No	Yes (panels A34-A39)	32,600													
8/27/01	Yes	No	Yes (panels A40-A47)	17,890													
8/28/01	Yes	No	Yes (panels A48-A51)	13,363													
8/29/01	Yes	No	Yes (panels A52-A55)	15,548													
8/30/01	Yes	No	Yes (panels A56-A59;	21,666													
			A54B; and A86-A87)														
8/31/01	Yes	No	Yes (panels A60-A63;	18,469													
			and A35A-A36A)														
9/2/01					PA1/PA2	DS-A1	Field	187	Pass	A	127	Pass					
										B	124	Pass					
							Lab	173	Pass	A	132	Pass					
										B	121	Pass					
					PA3/PA3A	DS-A2	Field	151	Pass	A	119	Pass					
										B	119	Pass					

OCF Table 6-1. Quality Assurance Tests for FML																	
						Destructive Tests Performed by Contractor							*Destructive Tests Performed by Engineering Inspector*				
Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seams Inspected (panels)	Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Sample No.	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 70 lbs/in)
							Lab	147	Pass	A	125	Pass					
										B	126	Pass					
					PA6/PA7A	DS-A3	Field	175	Pass	A	104	Pass	DS-A3	166	Pass	113	Pass
										B	116	Pass					
							Lab	170	Pass	A	134	Pass					
										B	135	Pass					
					PA8/PA9A	DS-A4	Field	183	Pass	A	121	Pass					
										B	136	Pass					
							Lab	176	Pass	A	152	Pass					
										B	132	Pass					
					PA9/PA9A	DS-A5	Field	155	Pass	A	121	Pass					
										B	131	Pass					
							Lab	144	Pass	A	135	Pass					
										B	128	Pass					
					PA12/PA13	DS-A6	Field	175	Pass	A	118	Pass					
										B	112	Pass					
							Lab	165	Pass	A	126	Pass					
										B	128	Pass					
					PA14/PA15A	DS-A7	Field	180	Pass	A	122	Pass					
										B	121	Pass					
							Lab	173	Pass	A	119	Pass					
										B	133	Pass					
					PA15/PA16	DS-A8	Field	175	Pass	A	114	Pass					
										B	119	Pass					
							Lab	174	Pass	A	120	Pass					
										B	134	Pass					
					PA14/PA15	DS-A9	Field	181	Pass	A	113	Pass					
										B	114	Pass					
							Lab	150	Pass	A	122	Pass					
										B	132	Pass					
					PA14/PA28	DS-A10	Field	165	Pass	A	116	Pass	DS-A10	141	Pass	102	Pass
										B	121	Pass					
							Lab	165	Pass	A	129	Pass					
										B	124	Pass					
9/5/01					PA34/PA54B	DS-A11	Field	171	Pass	A	116	Pass	DS-A11	144	Pass	100	Pass
										B	109	Pass					
							Lab	144	Pass	A	91	Pass					
										B	110	Pass					
					PA33/PA34	DS-A12	Field	194	Pass	A	109	Pass					
										B	105	Pass					
							Lab	168	Pass	A	125	Pass					
										B	134	Pass					
					PA36/PA37A	DS-A13	Field	192	Pass	A	154	Pass					
										B	158	Pass					

OCF Table 6-1. Quality Assurance Tests for FML																	
						Destructive Tests Performed by Contractor							*Destructive Tests Performed by Engineering Inspector*				
Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seams Inspected (panels)	Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Sample No.	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 70 lbs/in)
							Lab	172	Pass	A	145	Pass					
										B	151	Pass					
					PA29/PA30	DS-A14	Field	185	Pass	A	91	Pass	DS-A14	157	Pass	104	Pass
										B	124	Pass					
							Lab	167	Pass	A	131	Pass					
										B	130	Pass					
					PA24/PA25	DS-A15	Field	182	Pass	A	111	Pass					
										B	109	Pass					
							Lab	169	Pass	A	142	Pass					
										B	114	Pass					
					PA8/PA56	DS-A16[(1)]	Field	-	Pass	A	-	Pass	DS-A16	135	Pass	89	Fail[(2)]
										B	-	Pass				94	Pass
							Lab	143	Pass	A	117	Pass					
										B	122	Pass					
					PA35/PA35A	DS-A19	Field	178	Pass	A	109	Pass	DS-A19	153	Pass	90	Fail[(2)]
										B	115	Pass					
							Lab	144	Pass	A	90	Pass					
										B	105	Pass					
9/6/01					PA59A/PA60	DS-A17	Field	187	Pass	A	110	Pass					
										B	109	Pass					
							Lab	171	Pass	A	118	Pass					
										B	129	Pass					
					PA59A/PA6	DS-A18	Field	177	Pass	A	112	Pass	DS-A18	158	Pass	104	Pass
										B	117	Pass				108	Pass
							Lab	147	Pass	A	123	Pass					
										B	126	Pass					
					PA47/PA38	DS-A20	Field	170	Pass	A	112	Pass					
										B	120	Pass					
							Lab	146	Pass	A	116	Pass					
										B	116	Pass					
					PA39/PA40	DS-A21	Field	202	Pass	A	118	Pass					
										B	113	Pass					
							Lab	175	Pass	A	125	Pass					
										B	137	Pass					
					PA45/PA44	DS-A22	Field	174	Pass	A	116	Pass					
										B	110	Pass					
							Lab	157	Pass	A	108	Pass					
										B	124	Pass					
					PA51/PA47	DS-A23	Field	136	Pass	A	101	Pass	DS-A23	160	Pass	114	Pass
										B	106	Pass					
							Lab	168	Pass	A	124	Pass					
										B	112	Pass					
					PA52/PA48	DS-A24	Field	196	Pass	A	108	Pass					
										B	114	Pass					

OCF Table 6-1. Quality Assurance Tests for FML																	
						Destructive Tests Performed by Contractor							*Destructive Tests Performed by Engineering Inspector*				
Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seams Inspected (panels)	Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Sample No.	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 100 lbs/in)	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 70 lbs/in)
							Lab	168	Pass	A	98	Pass					
										B	135	Pass					
					PA54/PA54A	DS-A25	Field	169	Pass	A	124	Pass					
										B	122	Pass					
							Lab	141	Pass	A	135	Pass					
										B	124	Pass					
8/23/03	Yes		Yes (panels 87-91)	9,140	none												
8/24/03					P88s/P92	DS-26	Field	184	Pass	A	121	Pass					
										B	127	Pass					
							Lab	177	Pass	A	122	Pass					
										B	115	Pass					
					P87/P80	DS-27	Field	176	Pass	A	125	Pass					
										B	121	Pass					
					P86/P87A	DS-28	Field	175	Pass	A	134	Pass	DS-28	137	Pass	94	Pass
										B	133	Pass					
							Lab	173	Pass	A	136	Pass					
										B	139	Pass					
8/25/03	Yes		Yes (panels 64-67)	12,650	none												
8/26/03	Yes		Yes (panels 68-87)	39,168	none												
8/27/03					A1/P64	DS-A26	Field	181	Pass	A	130	Pass	DS-A27	165	Pass	87/81	Pass
										B	133	Pass					
8/28/03					P68/P69	DS-A27	Field	176	Pass	A	124	Pass					
										B	120	Pass					
					P77/P78	DS-A28	Field	173	Pass	A	121	Pass					
										B	125	Pass					
					P85/P86	DS-A29	Field	182	Pass	A	119	Pass					
										B	114	Pass					
							Lab	196	Pass	A	144	Pass					
										B	138	Pass					
					P87/P86	DS-A30	Field	184	Pass	A	137	Pass	DS-A30	140	Pass	64/41	Fail(2)
										B	135	Pass					
							Lab	155	Pass	A	118	Pass					
										B	122	Pass					
					P78/P69	DS-A31	Field	183	Pass	A	130	Pass	DS-A31	117	Pass	90/83	Pass
										B	139	Pass					
							Lab	151	Pass	A	130	Pass					
										B	139	Pass					

Note 1: This seam had several air test failures in many of the short sections along the seam. Therefore, the entire seam was capped and field destructive tests were not performed. However, a sample was submitted to the laboratory for destructive testing before the decision to cap the seam was made.

Note 2: Seam failed because one or more of the 5 trials were <70 ppi. This seam was subsequently enhanced and the effort was documented.

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
7/23/2001	P1/P2	R1	no
	P1/P2	R2	no
	P1/P15A	R3	no
	P2/P15A/P16	R4	no
	P2/P3/P16	R5	no
	P2	R6	no
	P3	R7	no
	P3	R8	no
	P3/P4	R9	no
	P4/P5/P5A	R10	no
	P5/P5A	R11	no
	P5/P5A/P6	R12	no
	P6/P7	R13	no
	P7/P8	R14	no
	P7/P8	R15	no
	P8/P9	R16	no
	P9/P10	R17	no
	P10/P11	R18	no
	P11/P12	R19	no
	P12/P13	R20	no
	P14/P31	R21	no
	P13/P14/P31	R22	no
	P12/P13/P25	R23	no
	P11/P12/P25/P24	R24	no
	P10/P11/P24/P23	R25	no
	P10/P23	R26	no
	P9/P10/P23	R27	no
	P9/P23	R28	no
	P9/P22	R29	no
	P8/P9/P22	R30	no
	P8/P21/P22	R31	no
	P7/P8/P21	R32	no
	P7/P21/P20	R33	no
	P6/P7/P20	R34	no
	P6/P19/P20	R35	no
	P5A/P19	R36	no
	P4/P5A/P18	R37	no
	P4/P18/P17A	R38	no
	P3/P4/P17A	R39	no
7/24/2001	P25/P31	R40	no
	P24/P25	R41	no
	P23/P24	R42	no
	P22/P21	R43	no
	P19/P19A/P20	R44	no
	P19/P19A/P18	R45	no
	P17/P18	R46	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	P16/P17	R47	no
	P15/P16	R48	no
	P27/P28/P28A	R49	no
	P28/P28A/P29	R50	no
	P32/P33	R51	no
	P33/P34	R52	no
	P34/P35	R53	no
	P35/P36	R54	no
	P40/P41	R55	no
	P41/P42	R56	no
	P38/P39	R57	no
	P30/P37/P37A	R58	no
	P37/P37A	R59	no
	P37/P37A/P36	R60	no
	P35/P36	R61	no
	P35/P34/P34A	R62	no
	P34/P34A/P33	R63	no
	P33/P32	R64	no
	P30/P32	R65	no
	P27/P28A	R66	no
	P27/P26	R67	no
	P27/P26	R68	no
	P26/P25/P25A	R69	no
	P25/P25A/P16	R70	no
	P15/P16	R71	no
	P15/P16	R72	no
	P15/P16	R73	no
	P16/P17/P17A	R74	no
	P17/P17A	R75	no
	P17/P17A/P18	R76	no
	P26/P27	R77	no
	P26/P27	R78	no
	P26/P15A	R79	no
	P15/P26/P26A	R80	no
	P26A/P15	R81	no
	P26/P26A/P27	R82	no
7/27/2001	P43/P1	R83	no
	P45/P46	R84	no
	P46/P47	R85	no
	P47/P48	R86	no
	P46/P47/P47A	R87	no
	P47/P47A/P48	R88	no
	P47A/P48	R89	no
	P49/P57	R90	no
	P57/P58	R91	no
	P58/P59	R92	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	P60/P61A/P61	R93	no
	P60/P59/61	R94	no
	P58/P59/P61	R95	no
	P58/P61	R96	no
	P58/P61/P62	R97	no
	P62/P58/P57	R98	no
	P49/P62/P56	R99	no
	P49/P56	R100	no
	P56/P56/P55	R101	no
	P55/P55A/P45	R102	no
	P55A/P49/P48	R103	no
	P55A/P48/P54	R104	no
	P55/P55A/P54	R105	no
	P54	R106	no
	P54/P48/P47A	R107	no
	P47A/P54/P53	R108	no
	P47A/P53/P46	R109	no
	P46/P53/P51	R110	no
	P46/P51	R111	no
	P46/P45/P51	R112	no
	P45/P50/P51	R113	no
	P45/P44	R114	no
	P45/P43/P50/P52	R115	no
	P44	R116	no
	P44	R117	no
	P44	R118	no
	P52/P44	R119	no
	P44	R120	no
	P44/P43A/P63A	R121	no
	P52/P65/P63A	R122	no
	P65/P67A/P64	R123	no
	P44/P43A/P63A	R124	no
	P44/P43/P43A	R125	no
	P43/P43A	R126	no
	P43/P43A/P1	R127	no
	P43A/P1/P15	R128	no
	P15/P26A/P43A	R129	no
	P43A/P65A/P64	R130	no
	P43A/P26A/P64	R131	no
	P63/P64	R132	no
	P64/P65/P26A	R133	no
	P65/P66/P27	R134	no
	P66/P27/P28	R135	no
	P66/P68/P28	R136	no
	P68/P28/P29	R137	no
	P68/P69/P29	R138	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	P68	R139	no
	P68	R140	no
	P68	R141	no
	P66A/P67/P65	R142	no
	P66A/P67/P68	R143	no
	P29/P30/P69	R144	no
	P30/P64/P70	R145	no
	P30/P32/P70	R146	no
	P32/P70/P71A	R147	no
	P33/P71A/P72	R148	no
	P71/P71A/P72	R149	no
	P70/P71/P71A	R150	no
	P68/P69/P29	R151	no
	P56	R152	no
	P55	R153	no
	P55	R154	no
	P54	R155	no
	P54	R156	no
	P53	R157	no
	P51	R158	no
	P51	R159	no
	P50/P52	R160	no
	P52/P63	R161	no
	P50	R162	no
	P50	R163	no
	P50/P50A/P51	R164	no
	P50A/P51	R165	no
	P50/P50A/P52	R166	no
	P66/P67/P67B	R167	no
	P65/P66/P66A	R168	no
	P66/P66A/P67	R169	no
	P67/P68	R170	no
	P67/P68	R171	no
	P67	R172	no
	P68	R173	no
	P67/P68	R174	no
	P67/P68	R175	no
	P66/P67/P67B	R176	no
	P70	R177	no
	P69	R178	no
	P69	R179	no
	P69	R180	no
	P71	R181	no
	P71	R182	no
	P71/P72	R183	no
	P71	R184	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	P75/P76/P77	R185	no
	P76/P77	R186	no
	P77	R187	no
	P75	R188	no
	P75	R189	no
	P75	R190	no
	P78	R191	no
	P75	R192	no
	P75	R193	no
	P75	R194	no
	P81/P82	R195	no
	P81/P82	R196	no
	P73/P74	R197	no
8/31/2001	PA1/PA2	R1	no
	PA1/PA2	R2	no
	PA1/PA2	R3	no
	PA2/PA3	R4	no
	PA3/PA3A	R5	no
	PA3A	R6	no
	PA3A/PA4	R7	no
	PA3/PA3A	R8	no
	PA5/PA5A	R9	no
	PA5A	R10	no
	PA5/PA5A	R11	no
	PA7/PA7A	R12	no
	PA7A	R13	no
	PA7A	R14	no
	PA7A	R15	no
	PA7A	R16	no
	PA7/PA7A	R17	no
	PA8/PA8A	R18	no
	PA8/PA7	R19	no
	PA8	R20	no
	PA9A	R21	no
	PA9A	R22	no
	PA9A	R23	no
	PA9/PA9A	R24	no
	PA9/PA8	R25	no
	PA10	R26	no
	PA10	R27	no
	PA10	R28	no
	PA10/PA32A	R29	no
	PA11/PA10	R30	no
	PA11	R31	no
9/1/2001	PA11	R32	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	PA11	R33	no
	PA12/PA11	R34	no
	PA12	R35	no
	PA12	R36	no
	PA12	R37	no
	PA12/PA11	R38	no
	PA13/PA12	R39	no
	PA13	R40	no
	PA14/PA13	R41	no
	PA12	R42	no
	PA12	R43	no
	PA12	R44	no
	PA12	R45	no
	PA13/PA12	R46	no
	PA13	R47	no
	PA14/PA13	R48	no
	PA14	R49	no
	PA14/PA28	R50	no
	PA14/PA28	R51	no
	PA14/PA28	R52	no
	PA15A/PA14	R53	no
	PA15/PA14	R54	no
	PA15/PA14	R55	no
	PA15/PA14	R56	no
	PA15/PA14	R57	no
	PA16/PA15	R58	no
	PA15/PA18	R59	no
	PA15/PA15A	R60	no
	PA15/PA27	R61	no
	PA27/PA26	R62	no
	PA26/PA16	R63	no
	PA17/PA18	R64	no
	PA17/PA18	R65	no
	PA17	R66	no
	PA18/PA17	R67	no
	PA16/PA17	R68	no
	PA18/PA17	R69	no
	PA18	R70	no
	PA18/PA23	R71	no
	PA19/PA18	R72	no
	PA19/PA22	R73	no
	PA20/PA19	R74	no
	PA21/PA20	R75	no
	PA22/PA21	R76	no
	PA23	R77	no
	PA25/PA25A	R78	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	PA28	R79	no
	PA29	R80	no
	PA29	R81	no
	PA33	R82	no
	PA35	R83	no
	PA35	R84	no
	PA33	R85	no
	PA33	R86	no
	PA32A	R87	no
	PA32A	R88	no
	PA32A	R89	no
	PA32A	R90	no
	PA34	R91	no
	PA35A/PA35	R92	no
	PA33/PA35A	R93	no
	PA35/PA35A	R94	no
9/3/2001	PA35A	R95	no
	PA37/PA37A	R96	no
	PA38/PA37	R97	no
	PA38	R98	no
	PA39	R99	no
	PA39	R100	no
	PA39	R101	no
	PA39	R102	no
	PA41/PA40	R103	no
	PA45	R104	no
	PA45	R105	no
	PA46	R106	no
	PA46	R107	no
	PA46	R108	no
9/7/2001	PA32/PA32A	R114	no
	PA32/PA32A	R115	no
	PA34	R116	no
	DS12	R117	no
	PA35	R118	no
	DS19	R119	no
	PA36/PA36A	R120	no
	PA36/PA36A/PA37A	R121	no
	PA36A/PA37	R122	no
	PA48A/PA37A	R123	no
	PA48A/PA37A	R124	no
	PA48A/PA37A/PA38/PA49	R125	no
	PA48A/PA47A	R126	no
	PA48A/PA47A	R127	no
	covered by repair R129	R128	no
	DS10	R129	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	PA38/PA47	R130	no
	PA38/PA39	R131	no
	PA39/PA47	R132A	no
	PA39	R132B	no
	DS21	R133	no
	DS14	R134	no
	DS15	R135	no
	DS9	R136	no
	DS8	R137	no
	DS7	R138	no
	DS10	R139	no
	DS6	R140	no
	DS5	R141	no
	DS4	R142	no
	DS3	R143	no
	DS2	R144	no
	DS1	R145	no
	PA35A/PA35	R146	no
	PA35A/PA35	R147	no
	PA35A/PA35	R148	no
	PA35/PA35A	R149	no
	PA35/PA36	R150	no
	PA36A/PA35A	R151	no
	PA36A/PA35A	R152	no
	PA52/PA48A/PA37A/PA36A	R153	no
	PA36A/PA37A	R154	no
	PA48A/PA37A	R155	no
	PA52/PA48A	R156	no
	PA48A	R157	no
	PA47/PA39/PA46A	R158	no
	PA46A/PA40/PA39	R159	no
	PA46/PA40/PA46A	R160	no
9/7/2001	PA46/PA40	R161	no
	PA46/PA41	R162	no
	PA45/PA41	R163	no
	PA45/PA42	R164	no
	PA45/PA43	R165	no
	PA45/PA44	R166	no
	PA45/PA44	R167	no
	PA45/PA44	R168	no
	PA45/PA44	R169	no
	PA46/PA45	R170	no
	PA46A/PA46	R171	no
	PA46A/PA46	R172	no
	PA49/PA48/PA47	R173	no
	PA51/PA47	R174	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	PA50/PA51	R175	no
	PA50/PA49	R176	no
	PA49/PA47	R177	no
	PA49/PA47	R178	no
	PA48A/PA49/PA48	R180	no
	PA48A/PA49/PA48	R181	no
	PA50/PA49	R182	no
	PA52/PA48	R183	no
	PA48	R184	no
	PA48	R185	no
	PA52/PA53	R186	no
	PA52/PA53/PA48A	R187	no
	PA48/PA48A	R188	no
	PA48A/PA53	R189	no
	PA52/PA48A	R190	no
	PA52/PA48A	R191	no
	PA52	R193	no
	PA52	R194	no
	PA52	R195	no
	PA52	R196	no
	PA52	R197	no
	PA52	R198	no
	PA52	R199	no
	PA52	R200	no
	PA53	R201	no
	PA53	R202	no
	PA53/PA54	R203	no
	PA54/PA54A	R204	no
	PA56/PA54	R205	no
	PA56/PA54	R206	no
	PA56	R207	no
	PA58/PA59A	R208	no
	PA58/PA59/PA59A	R209	no
	PA59A	R210	no
	PA59A	R211	no
	PA59	R212	no
	PA59	R213	no
	PA59	R214	no
	PA59	R215	no
	PA59	R216	no
	PA60	R217	no
	PA60	R218	no
	PA61A	R219	no
	PA61A	R220	no
	PA61A/PA61	R221	no
	PA61	R222	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	PA61	R223	no
	PA61	R224	no
	PA61A/PA62	R225	no
	PA62	R226	no
	PA62	R227	no
	PA62	R228	no
	PA63	R229	no
	PA63	R230	no
	PA63	R231	no
	PA36A	R232	no
	PA36A	R233	no
	PA36A	R234	no
	PA36A	R235	no
	PA37	R236	no
	PA33	R237	no
	PA33/PA32	R238	no
	PA54B	R239	no
	PA54B	R240	no
9/8/2001	PA54B	R241	no
	PA54B	R242	no
	PA35A	R243	no
	PA35A	R244	no
	PA35A	R245	no
	PA53	R246	no
	PA53	R247	no
	PA53	R248	no
	PA53	R249	no
	PA52	R250	no
	PA52	R251	no
	PA52	R252	no
	PA53	R253	no
	PA53/PA54	R254	no
	PA53/PA54	R255	no
	PA53/PA54	R256	no
	PA53/PA54	R257	no
	PA53/PA54	R258	no
	PA54B	R259	no
	PA54B	R260	no
	PA54B	R261	no
	PA54B	R262	no
	PA54B	R263	no
	PA54B	R264	no
	PA54B	R265	no
	PA54A	R266	no
	PA54A	R267	no
	PA54A	R268	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	Bottom	R269	no
	PA56	R270	no
	PA56	R271	no
	PA56	R272	no
	PA57	R273	no
	PA57	R274	no
	PA57	R275	no
	Bottom	R276	no
	Bottom	R277	no
	Bottom	R278	no
	PA57	R279	no
	PA58/PA59	R280	no
	PA58	R281	no
	PA58	R282	no
	PA58	R283	no
	PA58/PA59A	R284	no
	PA58/PA59A	R285	no
	PA59A	R286	no
	PA59A	R287	no
	PA59A	R288	no
	PA59A	R289	no
	PA59A/PA60	R290	no
	PA60	R291	no
	PA60	R292	no
	PA60/PA61A	R293	no
	PA60/PA61A	R294	no
	PA60/PA61A	R295	no
	PA61A	R296	no
	DSA17	R316	no
	PA59A	R317	no
8/24/2003	P88B/P89	R321	no
	P88B/P41/P88A	R322	no
	P90/P91/P87	R323	no
	P84/P85/P88	R324	no
	P86/P87A	R325	no
8/27/2003	PA1/PA64	R326	no
	PA1/PA64	R327	no
	PA1/PA64	R328	no
	PA64/PA65	R329	no
	PA1/PA64	R330	no
	PA1/PA64	R331	no
	PA64/PA65	R332	no
	PA64	R333	no
	PA64	R334	no
8/28/2003	PA68/PA69	R335	no

OCF Table 6-1. Quality Assurance Tests for FML			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	PA68/PA69	R336	no
	PA69/PA70	R337	no
	PA1E	R338	no
	PA1E	R339	no
	PA79/PA80/PA78	R340	no
	PA80/PA81/PA78	R341	no
8/28/2003	PA81/PA82	R342	no
	PA77/PA78	R343	no
	PA85/PA86	R344	no
	PA86/PA87	R345	no
	PA78/PA79	R346	no
	P87/E	R347	no
	P87/E	R348	no
	P87	R349	no
	P86/P85	R350	no
	P86	R351	no
	P67/P68	R352	no
	P75/P76	R353	no

OCF Table 6-1. Quality Assurance Tests for FML				
Air Pressure Tests				
Date	Wedge Weld Seams (panels)	Beginning Air Pressure	Ending Air Pressure	Pass/Fail (loss not to exceed 2 psi)
8/24/2003	P87B/P88	30	30	Pass
	P87A/P88	30	30	Pass
	P87/P88	30	30	Pass
	P88/P89	30	30	Pass
	P90/P91	30	30	Pass
8/27/2003	P64/P65	40	40	Pass
	P65/P66	40	40	Pass
	P66/P67	40	40	Pass
	P67/P68	40	40	Pass
	P68/P69	40	40	Pass
	P69/P70	40	40	Pass
	P70/P71	40	40	Pass
	P71/P72	40	40	Pass
	P73/P74	40	40	Pass
	P74/P75	40	40	Pass
	P75/P76	40	40	Pass
	P76/P77	40	40	Pass
	P77/P78	40	40	Pass
	P78/P79	40	40	Pass
8/28/2003	P79/P80	40	40	Pass
	P80/P81	40	40	Pass
	P81/P82	40	40	Pass
	P82/P83	40	40	Pass
	P83/P84	40	40	Pass
	P84/P85	40	40	Pass
	P85/P86	40	40	Pass
	P86/P87	40	40	Pass
	P78/P79	40	40	Pass
	P78/P80	40	40	Pass
	P80/P81	40	40	Pass
	P81/P82	40	40	Pass

OCF Table 6-1. Quality Assurance Tests for FML																	
Materials Tests																	
										Tensile Properties (machine direction)							
Lot	Roll No.	Density (grams/cm^3)[1]	Pass/Fail (≥0.94)	Thickness (mils)[2]	Pass/Fail (≥60mil)	Carbon Black Content (%)[3]	Pass/Fail (≥2 and ≤3)	Carbon Black Dispersion[4]	Pass/Fail (A-1 or A-2)	Strength at Break (lbs./in-width)[5]	Pass/Fail (≥75)	Strength at Yield (lbs./in-width)[5]	Pass/Fail (≥130)	Elongation at Break (%)[5]	Pass/Fail (≥100)	Elongation at Yield (%)[5]	Pass/Fail (≥13)
36	16420B	0.9472	Pass	61.4	Pass	2.16	Pass	A-1	Pass	208	Pass	156	Pass	528	Pass	16.1	Pass
36	16152B	0.9476	Pass	61.8	Pass	2.4	Pass	A-1	Pass	202	Pass	158	Pass	596	Pass	16.8	Pass
36	16408B	0.9468	Pass	61.9	Pass	2.21	Pass	A-1	Pass	173	Pass	153	Pass	505	Pass	16.6	Pass
36	16157B	0.9483	Pass	61.5	Pass	2.09	Pass	A-1	Pass	203	Pass	156	Pass	623	Pass	18	Pass
36	16148B	0.9488	Pass	61.2	Pass	2.43	Pass	A-1	Pass	193	Pass	154	Pass	584	Pass	16.8	Pass
36	16418B	0.9465	Pass	61.3	Pass	2.16	Pass	A-1	Pass	189	Pass	148	Pass	610	Pass	16.6	Pass
		Note 1: Result is average of 3 tests.		Note 2: Result is average of 10 tests.		Note 3: Result is average of 2 tests.		Note 4: Result is average of 6 tests.		Note 5: Result is average of 5 tests.							

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)

Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seam Tested	Sample No.	*Destructive Tests Performed by Contractor*						*Destructive Tests Performed by Engineering Inspector*				
							Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 50 lbs/in)	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Weld	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 50 lbs/in)
8/2/2005	Yes	Yes	Yes (Panel C-1)		Trials	NA	Field		Pass			Pass					
8/3/2005	Yes	Yes	Yes (Panel C-1A to C-3)		Trials	NA	Field		Pass			Pass					
8/4/2005	Yes	Yes	Yes (Panel C-4 to C-6)		Trials	NA	Field		Pass			Pass					
8/5/2005	Yes	Yes	Yes (Panel C-7 to C-12)		Trials	NA	Field		Pass			Pass					
8/6/2005	Yes	Yes	Yes (Panel C-13 to C-16)		Trials	NA	Field		Pass			Pass					
8/7/2005	Yes	Yes	Yes (Panel C-17 to C-21)		Trials	NA	Field		Pass			Pass					
8/8/2005	Yes	Yes	Yes (Panel C-22 to C-29)		Trials	NA	Field		Pass			Pass					
8/9/2005	Yes	Yes	Yes (Panel C-30 to C-35A)		Trials	NA	Field		Pass			Pass					
8/10/2005	Yes	Yes	Yes (Panel C-36 to C-39A)		Trials	NA	Field		Pass			Pass					
8/11/2005	Yes	Yes	Yes (Panel C-40 to C-45)		Trials	NA	Field		Pass			Pass					
					C-1A/C-2A	DS-C-1	Field	91	Pass	A	72	Pass					
										B	72	Pass					
							Lab	122	Pass	A	89	Pass					
										B	94	Pass					
					C-3/C-4	DS-C-2	Field	86	Pass	A	75	Pass					
										B	66	Pass					
							Lab	119	Pass	A	86	Pass					
										B	87	Pass					
					C-4/C-5	DS-C-3	Field	93	Pass	A	83	Pass					
										B	81	Pass					
							Lab	127	Pass	A	94	Pass					
										B	92	Pass					
					C-5/C-5A	DS-C-4	Field	98	Pass	A	82	Pass					
										B	82	Pass					
							Lab	116	Pass	A	80	Pass	96	Pass	A	57	Pass
										B	88	Pass			B	61	Pass
					C-3/C-5A	DS-C-5	Field	94	Pass	A	78	Pass					
										B	83	Pass					
							Lab	115	Pass	A	82	Pass					
										B	88	Pass					
					C-6/C-13	DS-C-6	Field	96	Pass	A	83	Pass					
										B	88	Pass					
							Lab	121	Pass	A	94	Pass					
										B	89	Pass					
					C-7/C-8A	DS-C-7	Field	106	Pass	A	89	Pass					
										B	80	Pass					
							Lab	123	Pass	A	102	Pass					
										B	90	Pass					
					C-9/C-10	DS-C-8	Field	123	Pass	A	86	Pass					
										B	88	Pass					
							Lab	126	Pass	A	92	Pass					
										B	97	Pass					
					C-11/C-11A	DS-C-9	Field	110	Pass	A	81	Pass					
										B	93	Pass					

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OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)																	
Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seam Tested	Sample No.	*Destructive Tests Performed by Contractor*						*Destructive Tests Performed by Engineering Inspector*				
							Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 50 lbs/in)	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Weld	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 50 lbs/in)
							Lab	103	Pass	A	97	Pass					
										B	93	Pass					
					C-19/C-20	DS-C-10	Field	134	Pass	A	90	Pass					
										B	86	Pass					
							Lab	121	Pass	A	91	Pass	118	Pass	A	73	Pass
										B	97	Pass			B	69	Pass
					C-14/C-14A	DS-C-11	Field	112	Pass	A	97	Pass					
										B	96	Pass					
							Lab	106	Pass	A	95	Fail[1]	95	Pass	A	89	Pass
										B	93	Pass			B	85	Pass
					C-15/C-16	DS-C-12	Field	123	Pass	A	93	Pass					
										B	90	Pass					
							Lab	125	Pass	A	102	Pass					
										B	96	Pass					
					C-17A/C-18	DS-C-13	Field	136	Pass	A	86	Pass					
										B	83	Pass					
							Lab	122	Pass	A	89	Pass					
										B	93	Pass					
					C-12/C-21	DS-C-14	Field	126	Pass	A	79	Pass					
										B	87	Pass					
							Lab	125	Pass	A	96	Pass					
										B	89	Pass					
					C-18/C-27	DS-C-15	Field	118	Pass	A	89	Pass					
										B	84	Pass					
							Lab	124	Pass	A	91	Pass					
										B	85	Pass					
					C-24/C-25	DS-C-16	Field	123	Pass	A	88	Pass					
										B	88	Pass					
							Lab	124	Pass	A	93	Pass					
										B	100	Pass					
					C-22/C-23	DS-C-17	Field	117	Pass	A	81	Pass					
										B	73	Pass					
							Lab	126	Pass	A	88	Pass					
										B	97	Pass					
					C-26/C-35	DS-C-18	Field	123	Pass	A	93	Pass					
										B	93	Pass					
							Lab	124	Pass	A	92	Pass					
										B	85	Pass					
8/12/2005	Yes	Yes	Yes (Panel C-46 to C-51)		Trials	NA	Field		Pass			Pass					
					C-31/C-34	DS-C-19	Field	103	Pass	A	77	Pass					
										B	83	Pass					
							Lab	109	Pass	A	84	Pass	97	Pass	A	82	Pass
										B	81	Pass			B	81	Pass
					C-29/C-30	DS-C-20	Field	123	Pass	A	92	Pass					

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)																	
							Destructive Tests Performed by Contractor						*Destructive Tests Performed by Engineering Inspector*				
Date	Surface Condition Inspected (yes/no)	Anchor Trench Measured (yes/no)	FML Placement Inspection (yes/no)	Square Feet Placed	Seam Tested	Sample No.	Field or Lab Test	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Weld	Seam Peel (average strength of 2 to 5 trials)	Pass/Fail (≥ 50 lbs/in)	Seam Shear (average strength of 2 to 5 trials)	Pass/Fail (≥ 70 lbs/in)	Weld	Seam Peel (average strength of 5 trials)	Pass/Fail (≥ 50 lbs/in)
										B	91	Pass					
							Lab	122	Pass	A	87	Pass					
										B	87	Pass					
					C-35A/C-36	DS-C-21	Field	117	Pass	A	77	Pass					
										B	76	Pass					
							Lab	125	Pass	A	85	Pass					
										B	83	Pass					
					C-37/C-37A	DS-C-22	Field	99	Pass	A	90	Pass					
										B	96	Pass					
							Lab	104	Pass	A	82	Fail[1]	94	Pass	A	79	Pass
										B	97	Pass			B	89	Pass
					C-38/C-39	DS-C-23	Field	117	Pass	A	81	Pass					
										B	78	Pass					
							Lab	122	Pass	A	85	Pass					
										B	84	Pass					
8/15/2005	NA	NA	No Placement		Trials	NA	Field		Pass			Pass					
					C-40/C-41A	DS-C-24	Field	117	Pass	A	81	Pass					
										B	72	Pass					
							Lab	131	Pass	A	88	Pass					
										B	87	Pass					
					C-41/C-41A	DS-C-25	Field	103	Pass	A	85	Pass					
										B	78	Pass					
							Lab	112	Pass	A	99	Pass	97	Pass	A	78	Pass
										B	101	Pass			B	84	Pass
					C-44AC-45	DS-C-26	Field	104	Pass	A	61	Pass					
										B	61	Pass					
							Lab	129	Pass	A	87	Pass					
										B	83	Pass					
					C-47/C-48	DS-C-27	Field	113	Pass	A	68	Pass					
										B	75	Pass					
							Lab	125	Pass	A	87	Pass					
										B	88	Pass					

Note 1: Non-FTB break, this seam was repaired by capping the seam *or extrusion welding the top flap to create a third weld.*

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)																	
Materials Tests																	
										Tensile Properties (machine direction)							
Lot	Roll No.	Density (grams/cm^3)[1]	Pass/Fail (≥0.94)	Thickness (mils)[2]	Pass/Fail (≥40mil)	Carbon Black Content (%)[3]	Pass/Fail (≥2 and ≤3)	Carbon Black Dispersion[4]	Pass/Fail (A-1 or A-2)	Strength at Break (lbs./in-width)[5]	Pass/Fail (≥50)	Strength at Yield (lbs./in-width)[5]	Pass/Fail (≥86)	Elongation at Break (%)[5]	Pass/Fail (≥100)	Elongation at Yield (%)[5]	Pass/Fail (≥13)
758	22911B	0.9438	Pass	41	Pass	2.56	Pass	A-1	Pass	131	Pass	110	Pass	471	Pass	17	Pass
760	22922B	0.9472	Pass	41	Pass	2.65	Pass	A-1	Pass	122	Pass	113	Pass	409	Pass	16	Pass
760	22919A	0.9465	Pass	41	Pass	2.57	Pass	A-1	Pass	127	Pass	117	Pass	406	Pass	16	Pass
		Note 1: Result is average of 3 tests.		Note 2: Result is average of 10 tests.		Note 3: Result is average of 2 tests.		Note 4: Result is average of 6 tests.		Note 5: Result is average of 5 tests.							

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)				
Air Pressure Tests				
Date	Wedge Weld Seams (panels)	Beginning Air Pressure[1]	Ending Air Pressure[1]	Pass/Fail[2] (loss not to exceed 2 psi)
8/4/2005	C-1/C-2 (x2)			Pass
	C-1/C-1A			Fail (cap)
	C-1A/C-2			Pass
	C-2/C-2A			Pass
	C-1A/C-1B			Pass
	C-1B/C-2A			Pass
	C-2A/C-3			Pass
	C-2/C-3			Pass
	C-1A/C-2A			Pass
8/6/2005	C-3/Patch			Pass
	Patch/C-4			Pass
	C-3/C-4 (x5)			Pass
	C-4/C-5			Pass
	C-4/C-5A			Pass
	C-5/C-5A			Pass
	C-3/C-5A			Pass
	C-3/C-6			Pass
	C-6/C-6A			Pass
	C-5A/C-6A			Pass
	C-5/C-6			Pass
	C-6/C-7			Pass
	C-3/C-6A			Pass
	C-7/C-8			Pass
	C-7/C-8A			Pass
	C-8/C-8A			Pass
	C-8/C-9			Pass
	C-8A/C-9			Pass
	C-9/C-10			Pass
	C-10/C-11			Pass
	C-10/C-11A			Pass
	C-11/C-11A			Pass
	C-11/C-12			Pass
	C-11A/C-12			Pass
	C-6/C-13			Pass
	C-6A/C-13			Pass
8/8/2005	C-13/C-14			Pass
	C-13/C-14A			Pass
	C-14/C-14A			Pass
	C-14/C-15			Pass
	C-14A/C-15			Pass
	C-15/C-16			Pass
	C-16/C-17			Pass
	C-16/C-17A			Pass
	C-17C-17A			Pass

Note 1: See Installation contractors non-destructive test log for pressures.
Note 2: Seams with failing air tests were capped or the top flap was extrusion welded as indicated.

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OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)				
Air Pressure Tests				
Date	Wedge Weld Seams (panels)	Beginning Air Pressure[1]	Ending Air Pressure [1]	Pass/Fail[2] (loss not to exceed 2 psi)
	C-17C-18			Pass
	C-17A/C-18			Pass
	C-19/C-20			Pass
	C-6/C-19			Pass
	C-6/C-20			Pass
	C-7/C-19			Fail (ext)
	C-8A/C-19			Fail (ext)
	C-9/C-19			Fail (ext)
	C-10/C-19			Pass
	C-11A/C-19			Pass
	C-12/C-19			Pass
	C-13/C-20			Pass
	C-14/C-20			Pass
	C-15/C-20			Pass
	C-16/C-20			Pass
	C-17/C-20			Pass
	C-18/C-20			Pass
	C-12/C-21			Pass
	C-21/C-22			Pass
	C-22/C-23			Pass
	C-23/C-24			Pass
	C-24/C-25			Pass
	C-25/C-26 (x2)			Pass
8/9/2005	C-19/C-27			Fail (cap)
	C-20/C-27			Pass
	C-18/C-27			Pass
	C-27/C-28			Pass
	C-28/C-29			Pass
	C-29/C-30			Pass
	C-30/C-31			Pass
	C-31/C-32			Pass
	C-12/C-33			Pass
	C-12/C-34			Pass
	C-10/C-34			Pass
	C-21/C-33			Fail (cap)
	C-22/C-33			Fail (cap)
	C-23/C-33			Fail (ext)
	C-24/C-33			Pass
	C-25/C-33			Pass
	C-26/C-33			Pass
	C-33/C-34			Pass
	C-27/C-34			Fail (cap)
	C-28/C-34			Fail (cap)
	C-29/C-34			Fail (cap)

Note 1: See Installation contractors non-destructive test log for pressures.
Note 2: Seams with failing air tests were capped or the top flap was extrusion welded as indicated.

k:tac-sec/files/008/1217/xls/OCF - Table 6-1 (Cover).xls/Air Tests

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)				
Air Pressure Tests				
Date	Wedge Weld Seams (panels)	Beginning Air Pressure[1]	Ending Air Pressure [1]	Pass/Fail[2] (loss not to exceed 2 psi)
	C-30/C-34			Pass
	C-31/C-34			Pass
	C-32/C-34			Pass
	C-26/C-35			Pass
	C-35/C-35A			Pass
	C-33/C-35A			Pass
	C-34/C-35A			Pass
	C-32/C-35A			Pass
8/10/2005	C-35/C-36 (x2)			Pass
	C-35A/C-36 (x2)			Pass
	C-36/C-37 (x2)			Pass
	C-36/C-37A			Pass
	C-37/C-37A			Pass
	C-37/C-38			Pass
	C-37A/C-38			Pass
	C-38/C-39			Pass
	C-38/C-39A			Pass
	C-39/C-39A			Pass
8/11/2005	C-39/C-40			Pass
	C-39A/C-40			Pass
	C-40/C-41			Pass
	C-40/C-41A			Pass
	C-41/C-41A			Pass
	C-41/C-42			Pass
	C-41A/C-42			Pass
	C-42/C-43			Pass
	C-43/C-44			Pass
	C-43/C-44A			Pass
	C-44/C-44A			Pass
	C-44/C-45			Pass
	C-44A/C-45			Pass
8/12/2005	C-45.C-46			Pass
	C-45/C-47			Pass
	C-45/C-48			Pass
	C-45/C-49			Pass
	C-45/C-50			Pass
	C-45/C-51			Pass
	C-46/C-47			Pass
	C-47/C-48			Pass
	C-48/C-49			Pass
	C-49/C-50			Pass
	C-50/C-51			Pass

Note 1: See Installation contractors non-destructive test log for pressures.
Note 2: Seams with failing air tests were capped or the top flap was extrusion welded as indicated.

k:tac-sec/files/008/1217/xls/OCF - Table 6-1 (Cover).xls/Air Tests

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
8/11/2005	C-1	R-1	no
	C-1	R-2	no
	C-1/C-2	R-3	no
	C-1/C-2	R-4	no
	C-1	R-5	no
	C-1/C-1A/C-2	R-6	no
	C-1/C-1A/C-2	R-7	no
	DS-C-1	R-8	no
	C-1A/C-2A	R-9	no
	C-1A/C-2A	R-10	no
	C-1A/C-2A	R-11	no
	C-1A/C-2A	R-12	no
	C-2A/C-3	R-13	no
	C-3/C-3A/C-5A	R-14	no
	C-2A/C-3	R-15	no
	C-2/C-3	R-16	no
	C-3	R-17	no
	C-3	R-18	no
	C-2/C-3	R-19	no
	C-2/C-3	R-20	no
	DS-C-2	R-21	no
	C-3/C-4	R-22	no
	C-3/C-4	R-23	no
	Patch/C-3/C-4	R-24	no
	C-1	R-25	no
	C-4/C-5	R-26	no
	DS-C-3	R-27	no
	C-4/C-5/C-5A	R-28	no
	DS-C-4	R-29	no
	C-5/C-5A/C-6	R-30	no
	DS-C-5	R-31	no
	C-3/C-5A/C-6	R-32	no
	C-3/C-6/C-6A	R-33	no
	C-6/C-6A/C-13	R-34	no
	DS-C-6	R-35	no
	C-6/C-13/C-20	R-36	no
	C-6/C-19/C-20	R-37	no
	C-6/C-7/C-19	R-38	no
	C-7/C-8/C-8A	R-39	no
	C-8/C-8A/C-9	R-40	no
	C-8A	R-41	no
	DS-C-7	R-42	no
	C-7/C-8A/C-19	R-43	no
	C-8A/C-9/C-19	R-44	no
	C-9/C-10	R-45	no

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	DS-C-8	R-46	no
	C-9/C-10/C-19	R-47	no
	C-7,C-8A,C-9,C-10/C-19	R-48	no
8/12/2005	C-10/C-11A/C-19	R-49	no
	C-10/C-11	R-50	no
	C-10/C-11/C-11A	R-51	no
	DS-C-9	R-52	no
	C-11/C-11A/C-12	R-53	no
	C-12	R-54	no
	DS-C-14	R-55	no
	C-21/C-33	R-56	no
	C-22/C-33	R-57	no
	C-12/C-21/C-33	R-58	no
	DS-C-17	R-59	no
	C-23/C-33	R-60	no
	DS-C-16	R-61	no
	C-23/C-24	R-62	no
	C-24/C-25	R-63	no
	C-25/C-26	R-64	no
	C-25/C-26	R-65	no
	DS-C-10	R-66	no
	C-6A/C-13	R-67	no
	C-6/C-14/C-14A	R-68	no
	DS-C-11	R-69	no
	C-14/C-14A/C-15	R-70	no
	DS-C-12	R-71	no
	C-16/C-17/C-17A	R-72	no
	C-17/C-17A/C-18	R-73	no
	DS-C-13	R-74	no
	DS-C-15	R-75	no
	C-18/C-20/C-27	R-76	no
	C-19/C-20/C-27	R-77	no
	C-17/C-18/C-20	R-78	no
	C-16/C-17/C-20	R-79	no
	C-15/C-16/C-20	R-80	no
	C-14/C-15/C-20	R-81	no
	C-13/C-14/C-20	R-82	no
	C-34/C-27,C-28,C-29	R-83	no
	C-12/C-19/C-34	R-84	no
	C-12/C-13/C-34	R-85	no
8/13/2005	C-28/C-29	R-86	no
	DS-C-20	R-87	no
	C-31/C-32	R-88	no
	DS-C-19	R-89	no
	C-31/C-32/C-34	R-90	no

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	C-32/C-34/C-35A	R-91	no
	C-33/C-34/C-35A	R-92	no
	C-26/C-33/C-35A	R-93	no
	C-26/C-35/C-35A	R-94	no
	C-36/C-35/C-35A	R-95	no
	C-33	R-96	no
	C-22/C-23	R-97	no
	C-32	R-98	no
	C-35	R-99	no
	DS-C-18	R-100	no
	C-26/C-35	R-101	no
	C-35/C-36	R-102	no
	C-35/C-35A/C-36	R-103	no
	C-36/C-37/C-37A	R-104	no
	DS-C-22	R-105	no
	C-37/C-37A/C-38	R-106	no
	DS-C-21	R-107	no
	C-35A	R-108	no
	C-35A/C-36	R-109	no
	C-36/C-37	R-110	no
	C-36/C-37	R-111	no
	C-37/C-38	R-112	no
	DS-C-23	R-113	no
	C-38/C-39/C-39A	R-114	no
	C-39/C-39A/C-40	R-115	no
	C-38/C-39A	R-116	no
	C-40	R-117	no
	C-39/C-40	R-118	no
	C-40/C-41	R-119	no
	C-40/C-41	R-120	no
	C-40/C-41/C-41A	R-121	no
	DS-C-25	R-122	no
	C-41/C-41A/C-42	R-123	no
	DS-C-24	R-124	no
	C-41A/C-42	R-125	no
	C-42	R-126	no
	C-42	R-127	no
	C-42/C-43	R-128	no
	C-42/C-43	R-129	no
	C-42/C-43	R-130	no
	C-42/C-43	R-131	no
	C-42/C-43	R-132	no
	C-43/C-44A	R-133	no
	C-43/C-44/C-44A	R-134	no
	C-44/C-45	R-135	no

OCF Table 6-1. Quality Assurance Tests for FML (OCF Cover, 40-mil HDPE, Textured)			
Vacuum Tests			
Date	Location of Test (panel or seam)	Repair No.	Visible Bubbles Observed (yes/no)
	C-44/C-44A/C-45	R-136	no
	DS-C-26	R-137	no
	C-45/C-51	R-138	no
	C-45/C-50/C-51	R-139	no
	C-45/C-49/C-50	R-140	no
	C-45/C-48/C-49	R-141	no
	C-45/C-47/C-48	R-142	no
	DS-C-27	R-143	no
	C-45/C-46/C-47	R-144	no
	C-45/C-46	R-145	no
	C-46	R-146	no

OCF Table 7-1. Construction Quality Testing for Geosynthetic Clay Liner																			
Field Tests					***Lab Tests***														
Date	Handling and Storage Checked (yes/no)	GCL Placement and Overlap Checked (yes/no)	Square Feet Placed	GCL Checked for Damage or Movement (yes/no)	Lot	Roll No.	Bentonite Mass Per Unit Area ($lbs./ft^2$)[1]	Pass/Fail ($\geq$0.75)	Index Flux ($m^3/m^2/sec$)	Pass/Fail ($\leq 1x\ 10^{-8}$)	Swell Index (ml/2g)	Pass/Fail ($\geq$24)	Fluid Loss (ml)	Pass/Fail ($\leq$18)	Geotextile Weight of Black Side (oz/yd^2)	Pass/Fail ($\geq$6)	Geotextile Weight of White Side (oz/yd^2)	Pass/Fail ($\geq$6)
8/13/2001	Yes	Yes	6,825	Yes	200128LO	00004194	1	Pass	3.2×10^{-9}	Pass	29	Pass	12.2	Pass	11.33	Pass	6.27	Pass
8/14/2001	Yes	Yes	14,925	Yes	200128LO	00004240	0.87	Pass	2.8×10^{-9}	Pass	30	Pass	10.2	Pass	17.16	Pass	9.06	Pass
8/15/2001	Yes	Yes	17,980	Yes	200128LO	00004245	0.95	Pass	2.7×10^{-9}	Pass	31	Pass	8.2	Pass	17.30	Pass	8.89	Pass
8/16/2001	Yes	Yes	21,075	Yes	200128LO	00004282	0.99	Pass	2.7×10^{-9}	Pass	31	Pass	8.4	Pass	16.90	Pass	8.63	Pass
8/17/2001	Yes	Yes	22,955	Yes														
8/18/2001	Yes	Yes	19,274	Yes														
8/20/2001	Yes	Yes	32,500	Yes			Note 1: Result is											
8/27/2001	Yes	Yes	19,895	Yes			average of 5 tests.											
8/28/2001	Yes	Yes	13,500	Yes														
8/29/2001	Yes	Yes	16,307	Yes														
8/30/2001	Yes	Yes	20,907	Yes														
8/31/2001	Yes	Yes	18,469	Yes														

OCF Table 7-1. Construction Quality Testing for Geosynthetic Clay Liner (OCF Cover)																		
Field Tests					***Lab Tests***													
Date	Handling and Storage Checked (yes/no)	GCL Placement and Overlap Checked (yes/no)	Square Feet Placed	GCL Checked for Damage or Movement (yes/no)	Lot	Roll No.	Bentonite Mass Per Unit Area $(lbs./ft^2)$[1]	Pass/Fail (≥0.75)	Index Flux $(m^3/m^2/sec)$	Pass/Fail (≤1x 10^{-8})	Swell Index (ml/2g)	Pass/Fail (≥24)	Fluid Loss (ml)	Pass/Fail (≤18)	Geotextile Weight of Black Side (oz/yd^2)[2]	Pass/Fail (≥6)	Geotextile Weight of White Side (oz/yd^2)[2]	Pass/Fail (≥6)
8/2/2005	Yes	Yes		Yes	200530LO	6809	0.83	Pass	2.8 x 10^{-9}	Pass	29	Pass	10.0	Pass	8.3	Pass	6.7	Pass
8/3/2005	Yes	Yes		Yes	200530LO	6857	0.78	Pass	2.4 x 10^{-9}	Pass	28	Pass	10.5	Pass	8.5	Pass	7.1	Pass
8/4/2005	Yes	Yes		Yes	200530LO	6933	0.90	Pass	2.4 x 10^{-9}	Pass	28	Pass	11.0	Pass	8.0	Pass	7.0	Pass
8/5/2005	Yes	Yes		Yes														
8/6/2005	Yes	Yes		Yes														
8/7/2005	Yes	Yes		Yes														
8/8/2005	Yes	Yes		Yes			Note 1: Result is average of 5 tests.								Note 2: Result is average of 3 tests.			
8/9/2005	Yes	Yes		Yes														
8/10/2005	Yes	Yes		Yes														
8/11/2005	Yes	Yes		Yes														
8/12/2005	Yes	Yes		Yes														

OCF Table 8-1. Construction Quality Assurance Testing for Geocomposites and Geofabrics

Cushion Layer

Date	Square Feet Placed	Roll No. Sampled for Lab Tests	Unit Weight (oz/yd²)¹	Pass/Fail (≥16)	MD Grab Tensile Strength (lbs.)²	Pass/Fail (≥275)	Trapezoidal Tear Strength (lbs.)²	Pass/Fail (≥115)	Burst Strength (psi)²	Pass/Fail (≥590)	Puncture Strength (lbs.)³	Pass/Fail (≥185)
#####	13,500	3266696	17.3	Pass	467	Pass	182	Pass	1064	Pass	324	Pass
			Note 1: Result is average of 3 tests.		Note 2: Result is average of 10 tests.						Note 3: Result is average of 15 tests.	

Non-Woven Separation Fabric

Date	Square Feet Placed	Roll No. Sampled for Lab Tests	Unit Weight (oz/yd²)¹	Pass/Fail (≥12)	MD Wide Width Tensile Strength (lbs./in)⁴	Pass/Fail (≥80)	Mullen Burst Strength (psi)²	Pass/Fail (≥290)	Apparent Opening Size (mm)⁵	Pass/Fail (≤0.21)
######	6750	sample submitted	15	Pass	111	Pass	884	Pass	0.141	Pass
######	2700	by manufacturer								
					Note 4: Result is average of 8 tests.				Note 5: Result is average of 5 tests.	

Geocomposite – Geofabric Portion

Date	Square Feet Placed	Roll No. Sampled for Lab Tests	Unit Weight (oz/yd²)¹	Pass/Fail (≥6)	MD Grab Tensile Strength (lbs.)²	Pass/Fail (≥205)	Flow Rate (gal/min/ft²)⁶	Pass/Fail (≥95)	Puncture Strength (lbs.)³	Pass/Fail (≥95)	Apparent Opening Size (mm)⁵	Pass/Fail (<0.3)
7/24/2001	13,500	4012975-4832	7.663	Pass	290	Pass	115	Pass	121	Pass	0.086	Pass
7/25/2001	13,500	4013025-4818	7.153	Pass	222	Pass	149	Pass	124	Pass	0.137	Pass
7/26/2001	72,000	4013053-4818	7.292	Pass	227	Pass	147	Pass	125	Pass	0.138	Pass
7/27/2001	55,500	4013077-4818	7.036	Pass	302	Pass	109	Pass	121	Pass	0.109	Pass
7/30/2001	65,000	4013049-4818	6.955	Pass	275	Pass	112	Pass	115	Pass	0.143	Pass
7/31/2001	62,000	4012950-4832	7.350	Pass	289	Pass	123	Pass	130	Pass	0.106	Pass
8/1/2001	45,500											
8/2/2001	26,000											
9/6/2001	58,550											
9/7/2001	48,198											
9/8/2001	46,438											
9/10/2001	43,645											
9/11/2001	34,524											
9/13/2001	4,350											
							Note 6: Result is average of 4 tests.					

Geocomposite – Geonet Portion

Date	Crush Strength (lbs./in²)⁵	Pass/Fail (≥50)	Thickness (mils)²	Pass/Fail (≥200)	Density (g/cm³)¹	Pass/Fail (≥0.94)	MD Tensile Strength (lbs./in)⁵	Pass/Fail (≥45)	Carbon Black (%)⁷	Pass/Fail (≥2)	MD Transmissivity (m2/sec)⁷	Pass/Fail (1×10^{-3})
7/24/2001	162.5	Pass	223	Pass	0.951	Pass	58.7	Pass	2.32	Pass	7.22×10^{-3}	Pass
7/25/2001	70.5	Pass	222.1	Pass	0.953	Pass	70.5	Pass	2.41	Pass	5.51×10^{-3}	Pass
7/26/2001	73.5	Pass	225.2	Pass	0.953	Pass	64.9	Pass	2.59	Pass	5.32×10^{-3}	Pass
7/27/2001	64.0	Pass	220.1	Pass	0.954	Pass	69.8	Pass	2.77	Pass	6.89×10^{-3}	Pass
7/30/2001	63.2	Pass	225.5	Pass	0.952	Pass	67.6	Pass	2.56	Pass	7.07×10^{-3}	Pass
7/31/2001	70.0	Pass	221.9	Pass	0.948	Pass	57.2	Pass	2.45	Pass	6.65×10^{-3}	Pass
									Note 7: Result is average of 2 tests.			

OCF Table 9-1. Granular Backfill, Bedding, Crushed Surfacing and Drainage Materials						
Material Type	Date	Amount Placed (cy)	Gradation	Pass/Fail (100%<1.5"; 95-100%<1.25"; 40-70%<3/4"; 5-20%<3/8"; 0-2%<No.4 sieve; and 0-0.5%<No. 200 sieve)	Permeability (cm/sec)	Pass/Fail (≥10)
Drainage Layer	8/4/2001	300	100% < 1.5"	Pass	14	Pass
	8/6/2001	5	99.6% < 1.25"			
	8/9/2001	30	61.8% < 3/4"			
	8/10/2001	5	15.4% < 3/8"			
	9/24/2001	150	1.1% < No. 4			
	9/25/2001	225	0.3% < No. 200			

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OCF Table 9-1. Granular Backfill, Bedding, Crushed Surfacing and Drainage Materials (OCF Cover)						
Material Type	Date	Amount Placed (cy)	Sample Number	Gradation Pass/Fail	Permeability (cm/sec)	Pass/Fail (≥10)
Boitic Layer Gravel	7/11/2005		Gravel#1	Pass	21	Pass
Boitic Layer Gravel	8/22/2005		BL-1	Pass		
Boitic Layer Gravel	9/6/2005		BL-2	Fail[1]		
Boitic Layer Gravel	9/1/2005		BL-3	Fail[2]		
Note 1: Test results indicate gradation low out of spec on 3/4" and 3/8" sieves.						
Note 2: Test results indicate gradation low out of spec on 3/8" sieve and hogh out of spec on #4 sieve.						

OCF Table 9-2. OCF Cell Backfill - Source Area Materials

Date	Amount Cushion Material Placed (cy)	Running Total Cushion Material (cy)	Sample Number	Gradation (%Fines)	Pass/Fail (100% ≤ 3/4", <20% Passing 200 Sieve	Source Area	Amount Source Area Material Placed OCF(w/o cush)(cy)	Running Total Source Area Material OCF (w/o cush) (cy)	Gradation 100% ≤ 24"	Pass/Fail Visual Observation 100% ≤ 24"	Application of Performance Specification to Stony Material (Yes)	Sample Number	Optimum Density/Moisture Representative Sample (pcf/%m)	Field Density/Moisture (pcf/%m)	% Compaction	Pass/Fail (>90% or >95% top 12")	Oven Water Content (%)	Pass/Fail Oven Water Content (%)
06/26/01			L-OCF-TBL9-2-CUSH-1	17.4	Pass													
06/26/01			L-OCF-TBL9-2-CUSH-2	19.3	Pass													
07/16/03	250	250																
07/17/03	560	810																
07/18/03												L-OCF-TBL9-2-SH-1	99.6/20.7			N/A		
07/18/03												L-OCF-TBL9-2-CCSP-1	147.4/7.2			N/A		
07/18/03						Arsenic Kitchen	40	40		Pass								
07/19/03						Arsenic Kitchen	200	240		Pass								
07/21/03	480	1290				Arsenic Kitchen	270	510		Pass								
07/22/03	20	1310				Arsenic Kitchen	360	870		Pass								
						Stockpile L	150	1020										
07/23/03						Arsenic Kitchen	150	1170		Pass								
						Stockpile L	170	1340										
07/24/03	170	1480				Arsenic Kitchen	380	1720		Pass		Silty Sand	99.6/20.7	100.3/16.8	101	Pass		
						Stockpile L	160	1880				Silty Sand	99.6/20.7	102.4/16.3	103	Pass		
07/25/03	250	1730				Arsenic Kitchen	420	2300		Pass		Silty Sand	99.6/20.7	99.9/13.1	100	Pass		
												Silty Sand	99.6/20.7	98.4/19.9	99	Pass		
												Silty Sand	99.6/20.7	95.9/15.8	96	Pass		
07/26/03	0	1730				Stockpile L	880	3180		Pass								
07/28/03	60	1790				Arsenic Kitchen	220	3400		Pass		CC/Debris/SS	N/A	122.7/6.8		ND		
						Stockpile L	330	3730				CC/Debris/SS	N/A	105.5/8.3		ND		
												CC/Debris/SS	N/A	118.0/8.4		ND		
												CC/Debris/SS	N/A	123.4/8.0		ND		
07/29/03	0	1790				Arsenic Kitchen	550	4280		Pass		CC/Debris/SS	N/A	125.2/8.9		ND		
						Stockpile L	590	4870										
07/31/03	190	1980				Arsenic Kitchen	20	4890		Pass		CC/Debris/SS	N/A	121.4/11.3		ND		
						Stockpile L	930	5820				CC/Debris/SS	N/A	117.4/14.6		ND		
08/01/03	110	2090				Stockpile L	1060	6880		Pass	Yes	SH/CCSP-1	125.5/12.5	129.2/6.8	103	Pass		
												SH/CCSP-1	125.5/12.5	119.7/13.9	95	Pass		
08/02/03	0	2090				Stockpile L	720	7600		Pass								
08/04/03	270	2360				Stockpile L	900	8500		Pass	Yes	L-OCF-TBL9-2-SH/CCSP-2(11)	131.5/10.8	132.0/10.7	100	Pass		
												L-OCF-TBL9-2-SH/CCSP-2(12)	131.5/10.8	120.5/14.2	92	Pass		
08/05/03	0	2360				Stockpile L	1420	9920		Pass	Yes	L-OCF-TBL9-2-SH/CCSP-2	137.3/9	117.7/14.4	85	Fail		
												L-OCF-TBL9-2-SH/CCSP-3	131.3/9.9	116.2/13.5	88	Fail		
08/06/03	220	2580				Stockpile L	880	10800		Pass	Yes	L-OCF-TBL9-2-SH/CCSP-2(14)	131.5/10.8	119.6/13.9	91	Pass		
												L-OCF-TBL9-2-SH/CCSP-2(15)	131.5/10.8	126.9/12.5	97	Pass		
												L-OCF-TBL9-2-SH/CCSP-2(16)	131.5/10.8	121.3/14.5	92	Pass		
08/07/03	110	2690				Stockpile L	760	11560		Pass	Yes	L-OCF-TBL9-2-WC-1					10.8	Pass
												L-OCF-TBL9-2-SH/CCSP-1(17)	125.7/12.5	114.9/15	98	Pass		
												L-OCF-TBL9-2-SH/CCSP-1(18)	121.3/14.1	110.0/17.7	91	Pass		
08/08/03	130	2820				Stockpile L	790	12350		Pass	Yes							
08/11/03	190	3010				Stockpile L	350	12700		Pass	Yes							
08/12/03	150	3160				Stockpile L	710	13410		Pass								
08/13/03	40	3200				Stockpile L	80	13490		Pass								
08/15/03	660	3860				Stockpile L	220	13710		Pass								
08/16/03						Stockpile L	270	13980										
08/18/03	200	4060				Stockpile L	620	14600				L-OCF-TBL9-2-SH/CCSP-1(17)	125.7/12.5	122.8/10.8	98	Pass		
08/19/03						Stockpile L	900	15500		Pass								
08/20/03						Stockpile L	910	16410		Pass								
08/21/03						Stockpile L	1280	17690										
08/22/03		4060				Stockpile L	1360	19050		Pass		L-OCF-TBL9-2-SH/CCSP-1(20)	125.7/12.5	121.6/15	95	Pass		
08/23/03	240	4300																
08/24/03		4300	L-OCF-CUSH-6	100/6.5	Pass													
08/25/03	440	4740																
08/26/03	280	5020	L-OCF-CUSH-4	100/45.5	Fail													
		5020	L-OCF-CUSH-5	100/13.1	Pass													
08/28/03	230	5250								Pass								
08/29/03	140	5390	L-OCF-CUSH-7	100/43.8	Fail													
09/02/03	370	5760				FOB	370	19420		Pass								
						Arsenic Kitchen	400	19820										
09/03/03	400	6160	L-OCF-CUSH-8	100/10.7	Pass	FOB	760	20580		Pass								
						Arsenic Kitchen	300	20880										
09/04/03	780	6940				FOB	1020	21900				L-OCF-TBL9-2-NFOB-1(21)	130.1/10.7	121.3/14.8	93	Pass		
						Arsenic Kitchen	550	22450				L-OCF-TBL9-2-NFOB-1(22)	130.1/10.7	120/16.1	92	Pass		
												L-OCF-TBL9-2-NFOB-1(23)	130.1/10.7	122.1/11.8	94	Pass		
												L-OCF-TBL9-2-NFOB-1	124/12.7	115.2/12.6	93	Pass		

OCF Table 9-2. OCF Cell Backfill - Source Area Materials

Date	Amount Cushion Material Placed (cy)	Running Total Cushion Material (cy)	Sample Number	Gradation (%Fines)	Pass/Fail (100% ≤ 3/4", <20% Passing 200 Sieve	Source Area	Amount Source Area Material Placed OCF(w/o cush)(cy)	Running Total Source Area Material OCF (w/o cush) (cy)	Gradation 100% ≤ 24"	Pass/Fail Visual Observation 100% ≤ 24"	Application of Performance Specification to Stony Material (Yes)	Sample Number	Optimum Density/Moisture Representative Sample (pcf/%m)	Field Density/Moisture (pcf/%m)	% Compaction	Pass/Fail (>90% or >95% top 12")	Oven Water Content (%)	Pass/Fail Oven Water Content (%)
09/05/03	30	6970				FOB	1900	24350		Pass		L-OCF-TBL9-2-NFOB-1(24)	130.1/10.7	133.6/10.2	103	Pass		
						Arsenic Kitchen	600	24950										
09/06/03						FOB	660	25610		Pass								
						Arsenic Kitchen	440	26050										
09/08/03						FOB	1020	27070		Pass								
						Arsenic Kitchen	580	27650										
09/09/03	210	7180				FOB	1160	28810										
						Arsenic Kitchen	620	29430										
						Stockpile L	110	29540										
09/10/03	630	7810				FOB	50	29590										
						Arsenic Kitchen	720	30310										
						Stockpile L	660	30970										
09/11/03						Arsenic Kitchen	1240	32210		Pass		L-OCF-TBL9-2-SPK-1	115.9/16.2	106.9/18.1	92	Pass		
						Stockpile L	670	32880										
09/12/03						Arsenic Kitchen	740	33620		Pass		L-OCF-TBL9-2-SPK-1(25)	122.4/13.6	119.6/9.1	98	Pass		
						Stockpile L	180	33800										
						Stockpile K	850	34650										
09/13/03						Arsenic Kitchen	380	35030		Pass		L-OCF-TBL9-2-SPK-1(26)	122.4/13.6	123.3/9.6	101	Pass		
						Stockpile K	680	35710				L-OCF-TBL9-2-SPK-1(27)	122.4/16.3	107.7/20.2	93	Pass		
09/15/03	380	8190				FOB	440	36150		Pass								
						Arsenic Kitchen	1320	37470										
						Stockpile K	150	37620										
						Stockpile Z	250	37870										
09/16/03	190	8380				FOB	330	38200		Pass		L-OCF-TBL9-2-SPK-1(28)	113.5/17.2	102.9/23.7	91	Pass		
						Arsenic Kitchen	490	38690				L-OCF-TBL9-2-SPK-1(29)	115.6/16.3	108.1/19.3	94	Pass		
						Stockpile Z	910	39600										
09/17/03						FOB	360	39960		Pass								
						Arsenic Kitchen	750	40710										
						Stockpile Z	960	41670										
09/18/03	360	8740				FOB	950	42620		Pass		L-OCF-TBL9-2-SH-2(30)	107.4/18.9	110.8/19.7	103	Pass		
						Arsenic Kitchen	1380	44000				L-OCF-TBL9-2-SH-2(31)	107.4/18.9	107.1/21.5	100	Pass		
						Stockpile Z	200	44200				LOCF-TBL9-2-SH-2(32)	107.4/18.9	111.0/17.3	103	Pass		
												L-OCF-TBL9-2-SH-2	101.1/22.0	98.4/21.7	97	Pass		
09/19/03	160	8900				FOB	1050	45250		Pass								
						Arsenic Kitchen	1300	46550										
						Stockpile Z	60	46610										
09/20/03						FOB	570	47180		Pass								
						Arsenic Kitchen	720	47900										
09/22/03	300	9200				FOB	1000	48900				L-OCF-TBL9-2-SH-2(33)	105.2/19.9	105.4/22.2	100	Pass		
						Arsenic Kitchen	1270	50170				L-OCF-TBL9-2-SH-2(34)	105.2/19.9	101.9/21.6	97	Pass		
						Stockpile L	80	50250				L-OCF-TBL9-2-SH-2(35)	114.5/15.7	112.7/16.4	98	Pass		
						Stockpile Z	390	50640										
09/23/03	150	9350				FOB	400	51040										
						Arsenic Kitchen	2470	53510										
						Stockpile L	140	53650										
						Stockpile K	50	53700										
09/24/03	350	9700				FOB	730	54430				L-OCF-TBL9-2-NFOB-1 (36)	122.1/13.4	112.9/19.2	92	Pass		
						Arsenic Kitchen	1780	56210										
09/25/03	240	9940				FOB	940	57150				L-OCF-TBL9-2-SH-3 (37)	89.6/30	93.4/28.4	104	Pass		
						Arsenic Kitchen	2250	59400				L-OCF-TBL9-2-SH-3	89.6/30	88.2/30.5	98	Pass		
09/26/03	250	10190				FOB	280	59680		Pass								
						Arsenic Kitchen	440	60120										
						Stockpile K	410	60530										
						Stockpile Z	510	61040										
09/27/03	120	10310				Stockpile Z	1490	62530										
09/29/03	400	10710	L-OCF-TBL9-2-CUSH-9	21.3	Pass*	FOB	1080	63610				L-OCF-TBL9-2-NFOB-1 (38)	130.1/10.7	128.5/13	99	Pass		
			L-OCF-TBL9-2-CUSH-1(	14.7	Pass	Stockpile Z	1220	64830				L-OCF-TBL9-2-NFOB-1 (39)	130.1/10.7	126.6/13	97	Pass		
09/30/03	330	11040				FOB	750	65580										
						Arsenic Kitchen	620	66200										
						Stockpile L	150	66350										
						Stockpile K	450	66800										
						Stockpile Z	880	67680										
10/01/03						Arsenic Kitchen	710	68390				L-OCF-TBL9-2-SH-2 (40)	105.2/19.9	99.7/25.4	95	Pass		
						Stockpile Z	1120	69510				L-OCF-TBL9-2-SH-3 (41)	89.6/30	85/33.1	95	Pass		
						Stockpile K	80	69590										
10/02/03						Stockpile K	320	69910										

OCF Table 9-2. OCF Cell Backfill - Source Area Materials

Date	Amount Cushion Material Placed (cy)	Running Total Cushion Material (cy)	Sample Number	Gradation (%Fines)	Pass/Fail (100% ≤ 3/4", <20% Passing 200 Sieve)	Source Area	Amount Source Area Material Placed OCF(w/o cush)(cy)	Running Total Source Area Material OCF (w/o cush) (cy)	Gradation 100% ≤ 24"	Pass/Fail Visual Observation 100% ≤ 24"	Application of Performance Specification to Stony Material (Yes)	Sample Number	Optimum Density/Moisture Representative Sample (pcf/%m)	Field Density/Moisture (pcf/%m)	% Compaction	Pass/Fail (>90% or >95% top 12")	Oven Water Content (%)	Pass/Fail Oven Water Content (%)
						Arsenic Kitchen	1460	71370										
						Stockpile Z	20	71390										
10/03/03						Stockpile Z	130	71520										
						Arsenic Kitchen	330	71850										
10/04/03						Arsenic Kitchen	730	72580										
10/05/03						Arsenic Kitchen	730	73310										
10/06/03						Arsenic Kitchen	240	73550										
10/07/03						Arsenic Kitchen	950	74500										
						Stockpile L	280	74780										
10/08/03						Arsenic Kitchen	80	74860										
10/09/03						FOB	190	75050										
						Stockpile L	560	75610										
						Arsenic Kitchen	110	75720										
10/10/03						Arsenic Kitchen	1920	77640										
						Stockpile L	450	78090										
10/11/03						FOB	20	78110										
						Stockpile K	190	78300										
10/13/03						Arsenic Kitchen	1770	80070										
						Stockpile K	460	80530										
						FOB	120	80650										
10/14/03	50	11090				Arsenic Kitchen	2980	83630										
						SFOB	100	83730										
10/15/03						Arsenic Kitchen	1040	84770										
						FOB	280	85050										
						South FOB	180	85230										
10/22/03						FOB	80	85310										
						Arsenic Kitchen	160	85470										
10/23/03						FOB	90	85560										
				*2:1 accepted cushion soil; screened stockpile Z														
04/26/04						AK Soil	1490	87050										
						AK Concrete	1000	88050										
04/27/04			OCF-TBL9-2-CUSH-11	41.2	Fail	AK Soil	1900	89950										
						AK Concrete	430	90380										
04/28/04						AK Soil	1640	92020				L-OCF-TBL9-2-SH-3(45)	89.6/30	86.4/30.2	96	Pass		
						AK Concrete	10	92030				L-OCF-TBL9-2-SPK-1(46)	113.5/17.2	108/17.3	95	Pass		
												L-OCF-TBL9-2-SPK-1(47)	122.4/13.6	125.7/17.4	103	Pass		
04/29/04						AK Soil	1890	93920		Pass								
						AK Concrete	200	94120										
04/30/04	110	11200				AK Soil	1950	96070		Pass		L-OCF-TBL9-2-SPK-1(48)	117.8/15.4	116.2/14.6	99	Pass		
						AK Concrete	200	96270				L-OCF-TBL9-2-SPK-1(49)	117.8/15.4	112.1/19	95	Pass		
05/03/04	230	11430				AK Soil	1750	97820		Pass								
						AK Concrete	570	98390										
						Debris	20	98410										
05/04/04	340	11770				AK Concrete	40	98450		Pass		L-OCF-TBL9-2-SPK-1(50)	122.4/13.6	121.9/12	100	Pass		
						AK Soil	1970	100420				L-OCF-TBL9-2-SPK-1(51)	122.4/13.6	123.5/10.7	101	Pass		
												L-OCF-TBL9-2-SPK-1(52)	117.8/15.4	107.1/10.1	91	Pass		
												L-OCF-TBL9-2-SPK-1(53)	122.4/13.6	122.2/12.1	100	Pass		
05/05/04	200	11970				AK Soil	1880	102300		Pass								
						AK Concrete	320	102620										
05/06/04	140	12110				AK Soil	1650	104270		Pass								
						North FOB	350	104620										
05/07/04	20	12130				AK Soil	510	105130										
						AK Concrete	40	105170										
						FOB	60	105230										
05/10/04	130	12260				AK Soil	1760	106990		Pass								
						North FOB	280	107270										
05/11/04	630	12890				AK Soil	2060	109330		Pass								
05/12/04	60	12950				AK Soil	1570	110900		Pass								
						AK Concrete	590	111490										
05/13/04	30	12980				AK Soil	1740	113230		Pass		L-OCF-TBL9-2-SH-3(54)	89.6/30	82.6/32.5	92	Pass		
						AK Concrete	540	113770				L-OCF-TBL9-2-SPK-1(55)	122.4/13.6	117.3/18.3	96	Pass		
												L-OCF-TBL9-2-SH-3(56)	98.6/24.2	93.9/27.5	95	Pass		
												L-OCF-TBL9-2-SH-3(57)	98.6/24.2	98.1/24.7	99	Pass		
												L-OCF-TBL9-2-SH-3(58)	98.6/24.2	90.3/31.1	92	Pass		
05/14/04						AK Soil	1780	115550		Pass								

OCF Table 92. OCF Cell Ba§ll - Soœ Æa Materials

Date	Amount Cushion Material Placed (cy)	Running Total Cushion Material (cy)	Sample Number	Gradation (%Fines)	Pass/Fail (100% ≤ 3/4", <20% Passing 200 Sieve	Source Area	Amount Source Area Material Placed OCF(w/o cush)(cy)	Running Total Source Area Material OCF (w/o cush) (cy)	Gradation 100% ≤ 24"	Pass/Fail Visual Observation 100% ≤ 24"	Application of Performance Specification to Stony Material (Yes)	Sample Number	Optimum Density/Moisture Representative Sample (pcf/%m)	Field Density/Moisture (pcf/%m)	% Compaction	Pass/Fail (>90% or >95% top 12")	Oven Water Content (%)	Pass/Fail Oven Water Content (%)
						AK Concrete	50	115600										
05/17/04	220	13200				AK Soil	2010	117610		Pass		L-OCF-TBL9-2-SPK-1(59)	113.5/17.2	105/17.2	93	Pass		
						AK Concrete	40	117650				L-OCF-TBL9-2-SPK-1(60)	117.8/15.4	110.7/17.8	94	Pass		
05/18/04	60	13260				AK Soil	2370	120020		Pass								
05/19/04	60	13320				AK Soil	1570	121590		Pass		L-OCF-TBL9-2-SPK-1(61)	113.5/17.2	105/17.2	90	Pass		
						AK Concrete	590	122180										
05/20/04	120	13440				AK Soil	1180	123360		Pass								
						AK Concrete	150	123510										
05/21/04						AK Soil	1680	125190		Pass		L-OCF-TBL9-2-SH-3(62)	98.6/24.2	93.3/23.6	95	Pass		
						AK Concrete	60	125250				L-OCF-TBL9-2-SPK-1(63)	117.8/15.4	116.9/15.3	99	Pass		
												L-OCF-TBL9-2-SPK-1(64)	122.4/13.6	119.2/13.9	97	Pass		
												L-OCF-TBL9-2-SH-3(65)	98.6/24.2	96.3/18	98	Pass		
												L-OCF-TBL9-2-SPK-1(66)	117.8/15.4	111.1/20.2	94	Pass		
05/24/04	60	13500				AK Soil	1200	126450		Pass								
05/25/04	220	13720				AK Soil	1340	127790		Pass		L-OCF-TBL9-2-SH-3(67)	103.9/21.3	101.5/14.2	98	Pass		
												L-OCF-TBL9-2-SPK-1(68)	122.4/13.6	123.7/12	101	Pass		
												L-OCF-TBL9-2-SPK-1(69)	122.4/13.6	128.5/14.2	105	Pass		
												L-OCF-TBL9-2-SPK-1(70)	122.4/13.6	121.3/10.9	99	Pass		
												L-OCF-TBL9-2-SH-3(71)	103.9/21.3	105.6/12.8	102	Pass		
06/01/04	120	13840				AK Soil	1150	128940		Pass								
06/02/04	100	13940				AK Soil	1530	130470		Pass								
06/03/04	140	14080				AK Soil	1250	131720		Pass								
06/04/04	180	14260				AK Soil	1450	133170		Pass		L-OCF-TBL9-2-SPK-1(72)	122.4/13.6	117.1/17.7	96	Pass		
												L-OCF-TBL9-2-SPK-1(73)	122.4/13.6	120.3/14.3	98	Pass		
												L-OCF-TBL9-2-SPK-1(74)	122.4/13.6	110.6/17.3	90	Pass		
												L-OCF-TBL9-2-SPK-1(75)	122.4/13.6	123.9/13.9	101	Pass		
06/07/04	40	14300				AK Soil	2090	135260		Pass								
						AK Concrete	60	135320										
06/08/04						AK Soil	2080	137400		Pass		L-OCF-TBL9-2-SH-3(76)	103.9/21.3	93.9/29.9	90	Pass		
												L-OCF-TBL9-2-SPK-1(77)	122.4/13.6	118.9/17.1	97	Pass		
												L-OCF-TBL9-2-SH-3(78)	103.9/21.3	96.4/29.1	93	Pass		
												L-OCF-TBL9-2-SH-3(79)	103.9/21.3	96/25.8	92	Pass		
												L-OCF-TBL9-2-SPK-1(80)	122.4/13.6	116.2/17	95	Pass		
06/09/04	40	14340				AK Soil	1620	139020		Pass								
						AK Concrete	50	139070										
06/10/04						AK Soil	1700	140770		Pass								
06/11/04						AK Soil	710	141480		Pass		L-OCF-TBL9-2-SPK-1(81)	122.4/13.6	125.4/10.8	102	Pass		
												L-OCF-TBL9-2-SH-3(82)	103.9/21.3	99.2/25	95	Pass		
												L-OCF-TBL9-2-SPK-1(83)	113.5/17.2	106.9/20.1	94	Pass		
												L-OCF-TBL9-2-SPK-1(84)	113.5/17.2	110.4/17.3	97	Pass		
06/14/04						AK Soil	860	142340		Pass								
06/15/04						AK Soil	890	143230		Pass		L-OCF-TBL9-2-SPK-1(85)	113.5/17.2	86.5/33.3	76	Fail**		
												L-OCF-TBL9-2-SPK-1(86)	113.5/17.2	104.9/22.9	92	Pass		
												L-OCF-TBL9-2-SH-3(87)	93.9/27.1	92.8/30.3	99	Pass		
06/16/04						AK Soil	800	144030		Pass		L-OCF-TBL9-2-SH-3(88)	93.9/27.1	88.9/32.5	95	Pass		
06/17/04						AK Soil	760	144790										
06/18/04	160	14500				AK Soil	1440	146230		Pass								
06/21/04	260	14760				AK Soil	1490	147720		Pass		L-OCF-TBL9-2-SPK-1(85A) retest	113.5/17.2	108/14.3	95	Pass		
06/22/04	90	14850				AK Soil	1780	149500		Pass								
						AK Concrete	20	149520										
06/23/04						AK Soil	320	149840		Pass								
06/24/04	90	14940				AK Soil	2370	152210		Pass		L-OCF-TBL9-2-SH-3(89)	89.6/30	80.6/38.6	90	Pass		
												L-OCF-TBL9-2-SH-3(90)	89.6/30	81.8/36.7	91	Pass		
												L-OCF-TBL9-2-SPK-1(91)	117.8/15.4	110.4/22.4	94	Pass		
												L-OCF-TBL9-2-SH-3(92)	89.6/30	83.1/35.5	93	Pass		
06/25/04	20	14960				AK Soil	2780	154990										
06/26/04						AK Soil	1290	156280										
06/28/04	40	15000				AK Soil	2720	159000		Pass		L-OCF-TBL9-2-SPK-1(93)	115.9/16.2	105.9/14.9	91	Pass		
												L-OCF-TBL9-2-SH-3(94)	101.2/21.3	94.8/18.3	94	Pass		
												L-OCF-TBL9-2-SH-3(95)	98.6/24.2	90.7/25.2	92	Pass		
06/29/04	70	15070				AK Soil	1820	160820										
06/30/04						AK Soil	2400	163220		Pass		L-OCF-TBL9-2-SPK-1(96)	111.5/18.1	102/22.8	91	Pass		
												L-OCF-TBL9-2-SH-3(97)	101.2/22.8	91.6/29.4	91	Pass		
												L-OCF-TBL9-2-SPK-1(98)	111.5/18.1	101.6/20.2	91	Pass		
07/01/04						AK Soil	2350	165570										
07/02/04	20	15090				AK Soil	2500	168070		Pass		L-OCF-TBL9-2-SH-3(99)	96.2/25.7	89.1/23.8	93	Pass		

OCF Table 9-2. OCF Cell Backfill - Source Area Materials

Date	Amount Cushion Material Placed (cy)	Running Total Cushion Material (cy)	Sample Number	Gradation (%Fines)	Pass/Fail (100% ≤ 3/4", <20% Passing 200 Sieve	Source Area	Amount Source Area Material Placed OCF(w/o cush)(cy)	Running Total Source Area Material OCF (w/o cush) (cy)	Gradation 100% ≤ 24"	Pass/Fail Visual Observation 100% ≤ 24"	Application of Performance Specification to Stony Material (Yes)	Sample Number	Optimum Density/Moisture Representative Sample (pcf/%m)	Field Density/Moisture (pcf/%m)	% Compaction	Pass/Fail (>90% or >95% top 12")	Oven Water Content (%)	Pass/Fail Oven Water Content (%)
												L-OCF-TBL9-2-SH-3(100)	120/14.5	109.9/13.6	92	Pass		
07/06/04	20	15110				AK Soil	2030	170100										
07/07/04						AK Soil	1030	171130		Pass								
						Screen	510	171640										
07/08/04	60	15170				AK Soil	1410	173050		Pass		L-OCF-TBL9-2-SH-3(101)	98.6/24.2	91.7/21.5	93	Pass		
												L-OCF-TBL9-2-SH-3(102)	98.6/24.2	95.4/22.3	97	Pass		
												L-OCF-TBL9-2-SH-3(103)	98.6/24.2	91.8/27.8	93	Pass		
												L-OCF-TBL9-2-RL-1(104)	111.5/16.7	101.9/15	91	Pass		
												L-OCF-TBL9-2-RL-1	114.5/15.5			N/A		
07/09/04						AK Soil	1160	174210		Pass								
						Screen	700	174910										
07/10/04						AK Soil	1560	176470		Pass								
						Screen	10	176480										
07/12/04						AK Soil	520	177000				L-OCF-TBL9-2-SH-3(105)	98.6/24.2	96.6/24.9	98	Pass		
						Screen	850	177850				L-OCF-TBL9-2-SH-3(106)	89.6/30	82.1/29.6	92	Pass		
												L-OCF-TBL9-2-SH-3(107)	93.9/27.1	89.4/24.4	95	Pass		
												L-OCF-TBL9-2-SH-3(108)	98.6/24.2	93.8/26.9	95	Pass		
												L-OCF-TBL9-2-RL-1(109)	124.1/12	124/14	100	Pass		
												L-OCF-TBL9-2-SH-3(110)	98.6/24.2	92.2/28.5	94	Pass		
07/13/04						AK Soil	1190	179040				EVT-SSP-0704	110/15.2			N/A		
						Screen	800	179840										
07/14/04						AK Soil	1700	181540				L-OCF-TBL9-2-SH-3(111)	89.6/30	86.7/29.5	97	Pass		
						Screen	460	182000				L-OCF-TBL9-2-RL-1(112)	119.6/13.6	113.7/15.9	95	Pass		
07/15/04						AK Soil	2220	184220										
07/16/04						AK Soil	1360	185580				L-OCF-TBL9-2-SH-3(113)	98.6/24.4	90.2/25.6	91	Pass		
						Screen	210	185790				L-OCF-TBL9-2-RL-1(114)	103.9/21.3	98.8/24	95	Pass		
												L-OCF-TBL9-2-SH-3(115)	98.6/24.4	88.4/29.2	90	Pass		
07/17/04						AK Soil	650	186440										
						Screen	390	186830										
07/19/04						AK Soil	730	187560										
						Screen	790	188350										
07/20/04						AK Soil	260	188610				L-OCF-TBL9-2-RL-1(116)	124.1/12	124.7/14	100	Pass		
						Screen	430	189040				L-OCF-TBL9-2-RL-1(117)	124.1/12	127.7/11	103	Pass		
07/21/04						AK Soil	610	189650										
						Screen	100	189750										
07/22/04						AK Soil	690	190440										
						Screen	590	191030										
07/23/04						AK Soil	870	191900				L-OCF-TBL9-2-NFOB-1(118)	130.1/10.7	137.6/7	106	Pass		
						Screen	230	192130				L-OCF-TBL9-2-NFOB-1(119)	130.1/10.7	134.8/11.4	104	Pass		
07/26/04						AK Soil	1480	193610										
						Screen	320	193930										
07/27/04						AK Soil	1560	195490										
07/28/04						AK Soil	370	195860										
07/29/04						AK Soil	230	196090										
08/23/04												EVT-SSP-0704(120)	116.3/13.0	121.9/14.4	105	Pass		
												EVT-SSP-0704(121)	116.3/13.0	114.3/17.2	98	Pass		
												EVT-SSP-0704(122)	116.3/13.0	120.9/14.2	104	Pass		
08/30/04												EVT-SSP-0704(123)	121.0/11.5	128.6/8.8	106	Pass		
												EVT-SSP-0704(124)	121.0/11.5	117.4/10.8	97	Pass		
												EVT-SSP-0704(125)	121.0/11.5	110.8/17.2	92	Pass		
												EVT-SSP-0704(126)	121.0/11.5	111.5/16.9	92	Pass		
												EVT-SSP-0704(127)	121.0/11.5	119.9/11.6	99	Pass		
												EVT-SSP-0704(128)	116.3/13.0	118.1/11.3	102	Pass		
												EVT-SSP-0704(129)	116.3/3.0	118.3/11.8	102	Pass		
09/09/04												EVT-SSP-0704(130)	121.0/11.5	111.7/17.3	92	Pass		
												EVT-SSP-0704(131)	121.0/11.5	109.8/16.8	91	Pass		
09/14/04												EVT-SSP-0704(132)	121.0/11.5	117.2/15.5	97	Pass		
												EVT-SSP-0704(133)	121.0/11.5	116.9/14.3	97	Pass		
												EVT-SSP-0704(134)	121.0/11.5	108.6/18.6	90	Pass		
09/16/04												EVT-SSP-0704(135)	121.0/11.5	114.1/17.8	94	Pass		
												EVT-SSP-0704(136)	121.0/11.5	113.5/16.7	94	Pass		
09/28/04												EVT-SSP-0704(137)	121.0/11.5	120.5/11.4	100	Pass		
												EVT-SSP-0704(138)	121.0/11.5	116.4/13.7	96	Pass		
												EVT-SSP-0704(139)	121.0/11.5	115.0/17.2	95	Pass		
												EVT-SSP-0704(140)	121.0/11.5	121.2/13.3	100	Pass		
												EVT-SSP-0704(141)	121.0/11.5	117.9/14.6	98	Pass		

OCF Table 9-2. OCF Cell Backfill - Source Area Materials

Date	Amount Cushion Material Placed (cy)	Running Total Cushion Material (cy)	Sample Number	Gradation (%Fines)	Pass/Fail (100% ≤ 3/4", <20% Passing 200 Sieve)	Source Area	Amount Source Area Material Placed OCF(w/o cush)(cy)	Running Total Source Area Material OCF (w/o cush) (cy)	Gradation 100% ≤ 24"	Pass/Fail Visual Observation 100% ≤ 24"	Application of Performance Specification to Stony Material (Yes)	Sample Number	Optimum Density/Moisture Representative Sample (pcf/%m)	Field Density/Moisture (pcf/%m)	% Compaction	Pass/Fail (>90% or >95% top 12")	Oven Water Content (%)	Pass/Fail Oven Water Content (%)
												EVT-SSP-0704(142)	121.0/11.5	112.5/15.0	93	Pass		
												EVT-SSP-0704(143)	121.0/11.5	116.3/14.9	96	Pass		
												EVT-SSP-0704(144)	121.0/11.5	115.1/16.8	95	Pass		
												EVT-SSP-0704(145)	121.0/11.5	110.2/19.3	95	Pass		
												EVT-SSP-0704(146)	121.0/11.5	118.4/14.6	98	Pass		
												EVT-SSP-0704(147)	121.0/11.5	117.2/14.4	97	Pass		
												EVT-SSP-0704(148)	121.0/11.5	123.5/13.2	102	Pass		
10/05/04												EVT-SSP-0704(149)	121.0/11.5	124.9/9.7	103	Pass		
												EVT-SSP-0704(150)	121.0/11.5	118.6/12.6	98	Pass		
												EVT-SSP-0704(151)	121.0/11.5	124.4/10.2	103	Pass		
												EVT-SSP-0704(152)	121.0/11.5	119.0/10.0	98	Pass		
												EVT-SSP-0704(153)	121.0/11.5	122.9/8.7	102	Pass		
												EVT-SSP-0704(154)	121.0/11.5	114.6/12.3	95	Pass		
												EVT-SSP-0704(155)	121.0/11.5	120.3/10.1	99	Pass		
												EVT-SSP-0704(156)	121.0/11.5	120.3/9.9	99	Pass		
												EVT-SSP-0704(157)	121.0/11.5	120.9/11.8	100	Pass		
												EVT-SSP-0704(158)	121.0/11.5	122.5/11.8	101	Pass		
												EVT-SSP-0704(159)	121.0/11.5	118.5/13.1	98	Pass		
												EVT-SSP-0704(160)	121.0/11.5	119.9/9.4	99	Pass		
												EVT-SSP-0704(161)	121.0/11.5	122.2/9.6	101	Pass		
												EVT-SSP-0704(162)	121.0/11.5	119.3/9.9	99	Pass		
												EVT-SSP-0704(163)	121.0/11.5	119.3/13.1	99	Pass		
												EVT-SSP-0704(164)	121.0/11.5	120.4/10.9	100	Pass		
														**Failing area was ripped and allowed to dry - subsequent testing in area passe				
2. OCF Cover Construction																		
07/15/05						Regrade previously placed waste						EVT-SSP-0704	121.0/11.5	121.1/12.3	100	Pass		
												EVT-SSP-0704	121.0/11.5	121.0/13.5	100	Pass		
												EVT-SSP-0704	121.0/11.5	129.6/9.2	107	Pass		
												EVT-SSP-0704	121.0/11.5	124.6/11.5	103	Pass		
												EVT-SSP-0704	121.0/11.5	124.2/13.2	103	Pass		
07/21/05			L-OCF-CUSH-12										123.0/12.5	121.9/12.9	99	Pass		
			L-OCF-CUSH-12										123.0/12.6	120.5/12.7	98	Pass		
07/25/05			L-OCF-CUSH-12										123.0/12.7	124.9/10.8	102	Pass		
			L-OCF-CUSH-12										123.0/12.8	123.9/10.1	101	Pass		
			L-OCF-CUSH-12										123.0/12.9	120.9/11.9	98	Pass		
			L-OCF-CUSH-12										123.0/12.10	123.3/11.5	100	Pass		
			L-OCF-CUSH-12										123.0/12.11	118.9/13.4	97	Pass		
			L-OCF-CUSH-12										123.0/12.12	122.4/10.6	100	Pass		
07/26/05			L-OCF-CUSH-12										123.0/12.13	122.9/11.3	100	Pass		
07/27/05			L-OCF-CUSH-12										123.0/12.14	123.6/11.1	101	Pass		
			L-OCF-CUSH-12										123.0/12.15	123.0/11.6	100	Pass		
			L-OCF-CUSH-12										123.0/12.16	122.9/12.2	100	Pass		
			L-OCF-CUSH-12										123.0/12.17	123.6/12.2	101	Pass		
07/28/05			L-OCF-CUSH-12										123.0/12.18	123.5/11.7	100	Pass		
			L-OCF-CUSH-12										123.0/12.19	121.2/12.5	99	Pass		
07/29/05			L-OCF-CUSH-12										123.0/12.20	124.2/10.9	101	Pass		
			L-OCF-CUSH-12										123.0/12.21	119.3/13.8	97	Pass		
			L-OCF-CUSH-12										123.0/12.22	121.1/10.1	99	Pass		
08/01/05			L-OCF-CUSH-12										123.0/12.23	128.3/9.7	104	Pass		
			L-OCF-CUSH-12										123.0/12.24	124.9/10.4	102	Pass		
			L-OCF-CUSH-12										123.0/12.25	117.7/9.5	96	Pass		
			L-OCF-CUSH-12										123.0/12.26	124.7/10.2	101	Pass		
			L-OCF-CUSH-12										123.0/12.27	122.5/10.1	100	Pass		
			L-OCF-CUSH-12										123.0/12.28	117.3/14.7	95	Pass		
08/05/05			L-OCF-CUSH-12										123.0/12.29	125.8/8.4	102	Pass		
			L-OCF-CUSH-12										123.0/12.30	123.9/8.5	101	Pass		
			L-OCF-CUSH-12										123.0/12.31	121.9/10.7	99	Pass		

OCF Table 9-3. Cover Soil														
Material Type	Date	Amount Placed (cy)	Sample Number	Gradation (Pass/Fail)	Liquid Limit	Plastic Limit	Max. Dry Density / Opt. Water Content	Field Density Test No.	In-place Density (WSDOT 613)	In-place Water Content (WSDOT 613)	Percent Compaction[2]	Pass/Fail (>95%)	In-place Density (ASTM D1556)	Water Content (ASTM D2216)
Top Soil	6/28/2005		TS-1	Pass			120.3/12.5							
Common Borrow	6/28/2005		CB-1	Pass[1]										
Common Borrow	7/7/2005		CB-2	Pass			128.5/5.7							
Common Borrow	9/12/2005		CB-3	Pass	Non-Plastic	Non-Plastic	128.9/6.2							
Common Borrow	9/15/2005		CB-4	Pass	Non-Plastic	Non-Plastic	125.0/6.0							
Common Borrow	9/20/2005		CB-5	Pass	Non-Plastic	Non-Plastic	125.8/6.0							
Common Borrow	9/21/2005		CB-6	Pass	Non-Plastic	Non-Plastic	126.8/6.0							
Common Borrow	9/24/2005							33	127.6	3.4	100	Pass		
								34	128.4	2.8	100	Pass		
								35	139.6	4.9	101	Pass		
								36	128.7	4.3	101	Pass		
								37	130.7	4.1	102	Pass		
								38	129.2	3.0	101	Pass		
								39	127.3	3.9	99	Pass		
								40	126.2	3.4	99	Pass		
								41	128.2	4.1	100	Pass		
								42	125.0	3.6	98	Pass		
								43	125.9	3.3	98	Pass		
								44	126.0	3.1	98	Pass		
								45	123.8	3.0	97	Pass		
								46	125.7	3.4	98	Pass		
								47	128.8	3.1	101	Pass		
								48	122.9	3.0	96	Pass		
								49	122.1	2.8	95	Pass		
								50	125.3	3.0	98	Pass		
								51	134.5	4.8	105	Pass		
								52	136.4	4.3	107	Pass		

Note 1: Source rejected by engineer due to high fines content.

Note 2: Percent compaction based on average max. dry density of samples CB-3 through CB-6.

APPENDIX C

Data Validation Report
Tacoma Smelter Site OCF Area Excavation

DATA VALIDATION REPORT
TACOMA SMELTER SITE
OCF AREA EXCAVATION SOIL DATA

APRIL THROUGH JUNE 1999

XRF AND CONFIRMATION DATA

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June 2000

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APPENDIX 2: Database (Sample Analysis Summary)

GLOSSARY OF TERMS

CCV ....Calibration Verification (Control) Sample

CLP ....Contract Laboratory Program

DQO ....Data Quality Objectives

IDL ....Instrument Detection Limit

LCS ....Laboratory Control Sample

MDL.................Method Detection Limit

OCF..................On-site Containment Facility

PDLG ....Project Detection Limit Goal

RPD..................Relative Percent Difference

RUSTON..........Hydrometrics' Ruston Laboratory

SOW.................Statement of Work

TSC-SLC..........Asarco's Technical Service Center - Salt Lake City

XRF...................X-ray Fluorescence

SUMMARY

Starting March 29, 1999 through June 23, 1999, Hydrometrics collected 78 surface soil samples at excavation depths and 3 borehole samples for the Asarco Tacoma Smelter Site On-site Containment Facility (OCF) excavation project (Primary Activity 01). These samples were collected and analyzed according to discussions with EPA and the Ruston Sampling and Analysis Plan (Hydrometrics, 1994). Data was validated according to the Remedial Action Quality Assurance Project Plan (Hydrometrics, 1998). All soil samples were analyzed using XRF methods by Hydrometrics' Soils Laboratory in Ruston, Washington. XRF confirmation samples were analyzed by Asarco's Technical Services Center (TSC-SLC) in Salt Lake City, Utah. Data validation codes and definitions are listed in Table 1. The Summary of Flagged Data is located in Table 2, and Table 3 contains the Summary of Sample and Quality Control Completeness. These tables are located in Appendix 1. The validated database containing XRF and XRF confirmation data is in Appendix 2.

Project data quality objectives were met for the soil sampling event. Precision, accuracy, and completeness information for this validation is summarized in Section 12 of this report. The only quality control violations were attributed to field duplicate samples. Two lead values for field duplicate samples were out of control limits, which resulted in the flagging of four lead results.

Overall, the soil samples collected for the OCF excavation project are deemed acceptable for the purposes of the project as outlined in the work plan (Hydrometrics, 1998), provided that qualified data is considered with appropriate caution. It should be noted that not all quality control deficiencies are equally serious, and some may have no practical impact on the data. No data were rejected based on the results of this data validation.

DATA VALIDATION REPORT

1. INTRODUCTION

This validation applies to the XRF and wet chemistry analysis of arsenic and lead. A total of 81 samples (78 surface samples and 3 borehole samples) were collected for the OCF area excavation project in Tacoma, Washington. Included with these samples were 14 field duplicates. In addition, two split samples (for XRF confirmation purposes) were sent from the Ruston lab to TSC-SLC for wet chemistry analysis.

- Validation procedures used are generally consistent with:
  - _X_ EPA National Functional Guidelines for Inorganic Data Review (EPA, 1994)
  - _X_ Work Plan - Remedial Action Comprehensive Plans and Documents (Hydrometrics, 1998).
  - ___ Other

- Overall level of validation:
  - ___ Contract Laboratory Program (CLP)
  - _X_ Standard - Wet chemistry results
  - ___ Visual
  - _X_ XRF Auto Validation (Hydrometrics, 1996) - XRF results

1. DELIVERABLES

- All laboratory document deliverables were present as specified in the CLP-Statement of Work (EPA, ILM04.0) and/or the project contract.
  - _X_ Yes
  - ___ No

- All documentation of field procedures was provided as required.
  - _X_ Yes
  - ___ No

2. FIELD QUALITY CONTROL SAMPLES

- **Field duplicates**

  Field duplicates have been collected at the proper frequency.
  - _X_ Yes
  - ___ No

Field duplicate relative percent differences (RPDs) were within the required control limits (RPD of 35% or less for soil matrix). If the sample or duplicate result is less than five times the PDLG, the RPD criterion is not used. In these cases, the difference (Diff) between the sample and the duplicate results must be within ± 2 times the PDLG for soil matrix.

___ Yes
_X_ No –see note

Note: Following is a summary of the field duplicate results that were out of control limits. Samples collected from the same lot and same day as these field duplicates were flagged.

Sample Date	Sample/Duplicate	Analyte	Original Result (mg/kg)	Duplicate Result (mg/kg)	RPD	# Flags
05/05/1999	OCQ3ABCD1 / D	Lead	186	267	35.8%	2
06/18/1999	OCE5ABCD-2 / -D	Lead	205	113	57.9%	2

Flagging: J4

3. LABORATORY PROCEDURES

- **Laboratory procedures followed**

  _X_ CLP-SOW - Wet Chemistry Analysis
  ___ SW-846
  ___ Standard Methods for Chemical Analysis of Water and Wastes
  _X_ XRF Standard Operating Procedures - XRF Analysis
  ___ Other

- **Holding times met**

  _X_ Yes
  ___ No

- **Consistency with project requirements**

  Analyses were carried out as requested.
  ___ Yes
  _X_ No -see note

  Note: Wet chemistry analysis followed CLP-SOW procedures including CLP deliverables, however, the work plan only required SW-846 methods and standard deliverables. This was due to the samples' cover letter, instructing the laboratory to use the CLP procedures. CLP procedures are consistent with SW-846 methods except that laboratory QC and deliverables are more comprehensive.

Project specified methods were used.
_X_ Yes (XRF for all soil samples and ICP-MS for confirmation samples)
____ No

4. DETECTION LIMITS

The work plan required the laboratories to verify and report the method detection limits (MDLs) on a yearly basis for XRF analysis and on a quarterly basis for wet chemistry analysis. The instrument detection limit (IDL) was reported by TSC-SLC instead of the MDL. For the purpose of this report, the IDL's were accepted in place of the MDL's. The following table lists the project detection limit goal (PDLG), laboratories' reporting levels and each laboratory's MDL or IDL.

		XRF Analysis		Wet Chemistry Analysis	
Analyte	**PDLG (ppm)**	**Ruston Lab Reporting Level* (ppm)**	**Ruston Lab MDL 9/3/1998 (ppm)**	**TSC-SLC Lab Reporting Limit (ppm)**	**TSC-SLC Lab ICP-MS IDL** 3/26/99 (ppm)**
Arsenic	20	10 / 20	4	5	0.182
Lead	20	10 / 20	8	5	0.0005

* The Ruston Lab used 10 ppm for arsenic and lead reporting limits from April 29 through June 21, 1999; and 20 ppm for arsenic and lead reporting limits June 22 and June 23, 1999.

** IDL adjusted using the sample dilution factor (1:100).

- Reporting detection limits met the PDLG's.
  _X_ Yes
  ____ No

- MDL's or IDL's were provided by the laboratories.
  _X_ Yes
  ____ No

- MDL or IDL verifications were up to date.
  _X_ Yes
  ____ No

5. CALIBRATION AND CALIBRATION VERIFICATIONS (XRF ANALYSIS ONLY)

- **Instrument Calibrations**
  All initial instrument calibrations were performed as specified in the XRF Standard Operating Procedures.
  _X_ Yes
  ____ No

- **Calibration Verifications**

  The calibration verification (CCV) standards were analyzed at the required frequency (1 CCV per 32 samples).

  _X_ Yes
  ___ No

  The CCV standard percent recovery results were within the required control limits (75-125%).

  _X_ Yes
  ___ No

6. LABORATORY DUPLICATES

- Laboratory duplicate samples were analyzed at the proper frequency (1 per 16 samples for XRF analysis and 1 per batch for wet chemistry analysis).

  _X_ Yes
  ___ No

- The laboratory duplicate relative percent differences (RPD's) were within the required control limits (RPD of 35% or less for soil matrix). If the sample or duplicate result is less than 5 times the PDLG, the RPD criterion is not used. In these cases, the difference between the sample and the duplicate results must be within ±2 times the PDLG for soil matrix.

  _X_ Yes
  ___ No

7. LABORATORY CONTROL SAMPLES

- The reference material used was of the correct matrix and concentration.

  _X_ Yes
  ___ No

- LCS's were analyzed at the proper frequency (1 LCS per 24 hours for XRF analysis and 1 per batch for wet chemistry).

  _X_ Yes
  ___ No

- LCS recoveries were within the required recovery percentage control limits (75-125% for XRF analysis and 80-120% for wet chemistry).

  _X_ Yes
  ___ No

8. MATRIX SPIKE (WET CHEMISTRY ANALYSIS ONLY)

- Matrix spike samples (pre-digestion) were analyzed at the proper frequency for theproject (1 per batch).

  _X_Yes

  ___No

- Matrix spike recoveries were within the required control limits (75-125%).

  _X_Yes

  ___No

9. LABORATORY PREPARATION BLANK (WET CHEMISTRY ANALYSIS ONLY)

Please note that the highest blank value associated with any particular analyte is the blank value used for the flagging process. Associated sample results less than five times the reporting level are flagged for possible elevated results, due to contamination.

- **Preparation blanks**

  Preparation blanks were analyzed at the proper frequency for the project (1 per batch).

  _X_Yes

  ___No

  All the analytes in the preparation blank were less than the PDLG.

  _X_Yes

  ___No

10. XRF CONFIRMATION SAMPLE COMPARISON

Two splits of samples analyzed by XRF techniques were sent from the Ruston Lab to TSC-SLC for confirmation analysis using traditional wet chemistry methods (digested using EPA Method 3050 and analyzed by ICP-MS Methods). The wet chemistry results were compared to XRF results by calculating the RPD for the two sets. The RPD control limit used for the comparison was 35%. For samples with results less than 5 times the PDLG, a difference of +/- 2 times the PDLG was used as the control limit.

- **XRF confirmation samples**

  Confirmation samples were analyzed at the proper frequency (1 per 50 samples).

  _X_Yes

  ___ No

  Confirmation sample results were within the criteria stated by the work plan.

  _X_Yes

  ___No

Following is a table summarizing the XRF and wet chemistry results for confirmation samples:

Sample Code	Sample Date	Analyte	XRF Result (mg/kg)	Wet Chemistry Result (mg/kg)	RPD/Diff
OCE11A1	6/13/1999	Arsenic	1937	1658	15.5% RPD
		Lead	1014	1021	0.7% RPD
OCA13ABD5-D	3/23/1999	Arsenic	24	22	2 mg/kg Diff
		Lead	49	41	8 mg/kg Diff

11. DATA QUALITY OBJECTIVES

- **Project data quality objectives (DQO's) met.**
  _X_ Yes
  ___ No

<u>Accuracy as Evaluated by Percent within Recovery Control Limits</u>
Accuracy is defined as the agreement between a measure value and a "true value."

- The accuracy objective for wet chemistry analysis is the evaluation of matrix spikes and LCS'. The control limits for matrix spikes is a recovery range of 75% to 125%, and 80% to 120%, respectively.

  For wet chemistry analysis, control limits were met 100% of the time for matrix spikes and LCS'.

- The accuracy objective for XRF analysis is the evaluation of LCS' and CCV's. The control limit for LCS' and CCV'S is a recovery range of 75% to 125%, or within 95% confidence limits of the known value, whichever is greater.

  For XRF analysis, control limits were met 100% of the time for LCS' and CCV's.

<u>Accuracy as Evaluated by Mean Percent Recovery (XRF Analysis Only)</u>
Accuracy for XRF analysis was further evaluated by calculating the mean percent recovery for all LCS' and CCV's.

<u>LCS:</u>

Arsenic	Total # of LCS':	13
	Mean % Recovery:	**96.3%**
	Standard Deviation:	10.4%

Lead	Total # of LCS':	13
	Mean % Recovery:	**100.2%**
	Standard Deviation:	1.0%

<u>**CCV:**</u>

Arsenic	Total # of CCV's:	17
	Mean % Recovery:	**96.6%**
	Standard Deviation:	9.9%
Lead	Total # of CCV's:	17
	Mean % Recovery:	**100.0%**
	Standard Deviation:	1.2%

Precision as Evaluated by Percent within Control Limits

Precision is defined as a measure of reproducibility of replicate measurements and is inversely related to the variability among the results obtained (e.g., highly variable results have low precision).

- The precision objective for wet chemistry analysis is the evaluation of laboratory duplicate samples. The duplicate control limit is 35% RPD for results greater than five times the PDLG; and +/- two times the PDLG for results less than or equal to the PDLG.

  For wet chemistry analysis, control limits were met 100% of the time for laboratory duplicates.

- The precision objective for XRF analysis is the evaluation of field and laboratory duplicate samples. The duplicate control limit is 35% RPD for results greater than five times the PDLG; and +/- two times the PDLG for results less than or equal to the PDLG.

  For XRF analysis, control limits were met 100% of the time for laboratory duplicates; and 92.9% of the time for field duplicates.

Precision as Evaluated by the Mean RPD (XRF Analysis Only)

Precision was further evaluated by calculating the mean RPD for laboratory and field duplicate pairs. The mean difference was used for the evaluation of duplicate pairs with one or more results less than five times the PDLG.

<u>**Field Duplicate:**</u>

Arsenic	Total # of pairs used for evaluation:	14
	# of RPD Calculations:	6
	Mean RPD:	**8.5%**
	RPD Standard Deviation:	7.1%
	# of Diff Calculations:	8
	Mean Diff:	**4.9**
	Diff Standard Deviation:	4.6

Lead	Total # of pairs used for evaluation:	14
	# of RPD Calculations:	7
	Mean RPD:	**20.3%**
	RPD Standard Deviation:	18.6%
	# of Diff Calculations:	7
	Mean Diff:	**5.7**
	Diff Standard Deviation:	6.6

Laboratory Duplicate:

Arsenic	Total # of pairs used for evaluation:	16
	# of RPD Calculations:	12
	Mean RPD:	**3.0%**
	RPD Standard Deviation:	2.5%
	# of Diff Calculations:	4
	Mean Diff:	**1.8**
	Diff Standard Deviation:	1.7
Lead	Total # of pairs used for evaluation:	16
	# of RPD Calculations:	11
	Mean RPD:	**2.2%**
	RPD Standard Deviation:	2.2%
	# of Diff Calculations:	5
	Mean Diff:	**2.0**
	Diff Standard Deviation:	2.7

Overall Completeness

Completeness is achieved when the number of valid measurements is sufficient to satisfactorily address all important issues about the site. Completeness is calculated as the number of valid (not rejected) measurements divided by the total number of planned measurements, expressed as a percentage.

The target completeness for this project is 90%. This target was met as 100% of the planned sample measurements were analyzed and deemed valid. Refer to Table 3 in Appendix 1 for a complete summary of completeness.

Completeness expressed as:

- **No. of valid measurements per no. of planned measurements: 100%**
- **Percent of results not rejected: 100%**
- **Percent of results not qualified (not flagged): 95.2%**

Overall, the soil samples collected for the Asarco Tacoma OCF area excavation project were deemed acceptable for the purposes of the project as outlined in the work plan (Hydrometrics, 1998), provided that qualified data is considered with appropriate caution. It should be noted that not all quality control deficiencies are equally serious, and some may have no practical impact on the data. No data were rejected based on the results of this data validation.

DATA VALIDATION REPORT

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Reviewed by: Kris Downs

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Hydrometrics, 1994. Sampling and Analysis Plan for Excavation and Removal of Soils - Ruston and North Tacoma, Washington. September 1994

Hydrometrics, 1996. Validation of Soils Analyzed by XRF. Hydrometrics. October 1996.

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Standard Operating Procedure. Spectrace 5000 EDSRF Routine Soil Analysis. Hydrometrics (HL-SOP-53-1/95).

APPENDIX 1

Tables

TABLE 1.

DATA VALIDATION CODES AND DEFINITIONS

CODE		DEFINITION
J	-	The associated numerical value is an estimated quantity because quality control criteria were not met. Subscripts for the "J" qualifier: 2 - Calibration range exceeded or significant deviation from known value. Possible bias. 3 - Holding time not met. May indicate a bias. 4 - Other QC outside control limits. 5 - Quality control sample was omitted. (Not an EPA code.)
UJ	-	The material was analyzed for, but was not detected above the associated value. 1 - Blank contamination. Indicates possible high bias and/or false positive. 2 - Calibration range exceeded or significant deviation from known value. Possible bias. 3 - Holding time not met. Indicates low bias. 4 - Other QC outside control limits. 5 - Quality control sample was omitted. (Not an EPA code.)
R	-	Quality control indicates that the data are unusable (compound may or may not be present). Re-sampling and/or re-analysis is necessary for verification.
A	-	Anomalous data. No apparent explanation for discrepancy in data. (Not an EPA code.)

TABLE 3. SUMMARY OF SAMPLE AND QUALITY CONTROL COMPLETENESS
OCF AREA EXCAVATION SOIL DATA
APRIL 29, 1999 THROUGH JUNE 23, 1999

OVERALL COMPLETENESS						
Parameter	# Planned Analyses	# Actual Analyses	# of Valid	% Valid / Planned	# Valid Analyses without Flags	% Valid Analyses without Flags
ARSENIC	83	83	83	100.0%	83	100%
LEAD	83	83	83	100.0%	79	95.2%

QC COMPLETENESS					
LABORATORY DUPLICATES					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	17	17	100%	7	243%
LEAD	17	17	100%	7	243%
FIELD DUPLICATES (XRF ONLY)					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	14	14	100%	14	100%
LEAD	14	12	86%	14	100%
LABORATORY CONTROL SAMPLES					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	14	14	100%	14	100%
LEAD	14	14	100%	14	100%
CONTINUING CALIBRATION VERIFICATION SAMPLES (XRF ONLY)					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	17	17	100%	3	567%
LEAD	17	17	100%	3	567%
MATRIX SPIKES (WET CHEMISTRY ONLY)					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	1	1	100%	1	100%
LEAD	1	1	100%	1	100%
PREP BLANKS (WET CHEMISTRY ONLY)					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	1	1	100%	1	100%
LEAD	1	1	100%	1	100%
XRF CONFIRMATION SAMPLES					
Parameter	# of Samples	# Within Control Limits	% Within Control Limts	# Required	Actual Frequency
ARSENIC	2	2	100%	2	100%
LEAD	2	2	100%	2	100%

APPENDIX 2

DATABASE
(Sample Analysis Summary)

PARAMETER: PB (5.414)

SITE CODE	SAMPLE NUMBER	LAB NUMBER	SAMPLE DATE	ANALYSIS DATE.	PARAM ANALYTE	RESULT	UNITS	FLAG(S)
OCQ3	OCQ3ABCD1	99R-00833	05/05/19	05/06/19	PB	186	PPM	J4,FLDDUP
OCQ3	OCQ3ABCD1D	99R-00834	05/05/19	05/06/19	PB	267	PPM	J4,FLDDUP
OCE5	OCE5ABCD-2	99R-02205	06/18/19	06/18/19	PB	205	PPM	J4,FLDDUP
OCE5	OCE5ABCD-2-D	99R-02206	06/18/19	06/18/19	PB	113	PPM	J4,FLDDUP

INDEX

SAMPLE NUMBER ORDER

Page	Sample Number	Lab ##	Date	Site Code
2	OCA11ABCD-2	99R-02145	06/16/1999	OCA11
2	OCA11ABCD-2-D	99R-02146	06/16/1999	OCA11
2	OCA11ABCD1	99R-01969	06/13/1999	OCA11
3	OCA13ABD-2	99R-02144	06/16/1999	OCA13
3	OCA13ABD-3	99R-02239	06/21/1999	OCA13
3	OCA13ABD-4	99R-02301	06/22/1999	OCA13
3	OCA13ABD-5	99R-02343	06/23/1999	OCA13
4	OCA13ABD-5-D	1999-5055	06/23/1999	OCA13
4	OCA13ABD-5-D	99R-02344	06/23/1999	OCA13
2	OCA13ABD1	99R-01970	06/13/1999	OCA13
1	OCA1ABCD1	99R-01211	05/18/1999	OCA1
1	OCA3ABCD1	99R-01735	06/03/1999	OCA3
1	OCA5ABCD1	99R-01790	06/04/1999	OCA5
1	OCA7ABCD1	99R-01962	06/13/1999	OCA7
2	OCA9ABCD1	99R-01966	06/13/1999	OCA9
6	OCC11ABCD-2	99R-02143	06/16/1999	OCC11
6	OCC11ABCD-3	99R-02240	06/21/1999	OCC11
6	OCC11ABCD1	99R-01968	06/13/1999	OCC11
4	OCC1ABCD1	99R-01210	05/18/1999	OCC1
4	OCC3ABCD1	99R-01734	06/03/1999	OCC3
5	OCC5ABCD1	99R-01791	06/04/1999	OCC5
5	OCC7ABCD-2	99R-02141	06/16/1999	OCC7
5	OCC7ABCD1	99R-01961	06/13/1999	OCC7
5	OCC9ABCD1	99R-01965	06/13/1999	OCC9
9	OCE11A-2	99R-02142	06/16/1999	OCE11
9	OCE11A-3	99R-02241	06/21/1999	OCE11
9	OCE11A-4	99R-02339	06/22/1999	OCE11
8	OCE11A1	1999-5054	06/13/1999	OCE11
8	OCE11A1	99R-01967	06/13/1999	OCE11
8	OCE1ABCD1	99R-01209	05/18/1999	OCE11
6	OCE3ABCD1	99R-01733	06/03/1999	OCE3
7	OCE5ABCD-2	99R-02205	06/18/1999	OCE5
7	OCE5ABCD-2-D	99R-02206	06/18/1999	OCE5
6	OCE5ABCD1	99R-01955	06/13/1999	OCE5
7	OCE5ABCD1-D	99R-01956	06/13/1999	OCE5
7	OCE7ABCD1	99R-01960	06/13/1999	OCE7
8	OCE9ABCD-2	99R-02207	06/18/1999	OCE9
8	OCE9ABCD-3	99R-02242	06/21/1999	OCE9
8	OCE9ABCD-3-D	99R-02243	06/21/1999	OCE9
7	OCE9ABCD1	99R-01964	06/13/1999	OCE9
9	OCG1ABCD1	99R-01208	05/18/1999	OCG1
9	OCG3ABCD1	99R-01732	06/03/1999	OCG3
10	OCG5ABCD1	99R-01792	06/04/1999	OCG5
10	OCG7ABCD-2	99R-02208	06/18/1999	OCG7
10	OCG7ABCD-3	99R-02244	06/21/1999	OCG7
10	OCG7ABCD1	99R-01959	06/13/1999	OCG7
11	OCG9AD-2	99R-02209	06/18/1999	OCG9
11	OCG9AD-3	99R-02245	06/21/1999	OCG9
11	OCG9AD-4	99R-02340	06/22/1999	OCG9
11	OCG9AD-4-D	99R-02341	06/22/1999	OCG9
10	OCG9AD1	99R-01963	06/13/1999	OCG9
11	OCI1ABCD1	99R-01207	05/18/1999	OCI1
12	OCI3ABCD1	99R-01731	06/03/1999	OCI3
12	OCI5ABCD1	99R-01794	06/04/1999	OCI5
12	OCI5ABCD1-D	99R-01795	06/04/1999	OCI5
12	OCI7ABD1	99R-01958	06/13/1999	OCI7
13	OCK1ABCD1	99R-01205	05/18/1999	OCK1
13	OCK1ABCD1-D	99R-01206	05/18/1999	OCK1
13	OCK3ABCD1	99R-01729	06/03/1999	OCK3
13	OCK3ABCD1-D	99R-01730	06/03/1999	OCK3
13	OCK5ABCD1	99R-01793	06/04/1999	OCK5
14	OCK7ACD-2	99R-02210	06/18/1999	OCK7
14	OCK7ACD1	99R-01957	06/13/1999	OCK7
14	OCM1ABCD1	99R-00772	05/03/1999	OCM1
14	OCM3ABCD1	99R-00836	05/05/1999	OCM3
15	OCM5ABCD1	99R-01738	06/03/1999	OCM5
15	OCM7ABD1	99R-01739	06/03/1999	OCM7
15	OCM7ABD2	99R-01859	06/08/1999	OCM7
15	OCM7ABD2-D	99R-01860	06/08/1999	OCM7
15	OCO1ABCD1	99R-00770	05/03/1999	OCO1

LAB NUMBER ORDER

Page	Lab ##	Sample Number	Date	Site Code
8	1999-5054	OCE11A1	06/13/1999	OCE11
4	1999-5055	OCA13ABD-5-D	06/23/1999	OCA13
17	99R-00651	OCQ1ABCD1	04/29/1999	OCQ1
17	99R-00652	OCQ1ABCD1-D	04/29/1999	OCQ1
15	99R-00770	OCO1ABCD1	05/03/1999	OCO1
16	99R-00771	OCO1ABCD1-D	05/03/1999	OCO1
14	99R-00772	OCM1ABCD1	05/03/1999	OCM1
17	99R-00833	OCQ3ABCD1	05/05/1999	OCQ3
17	99R-00834	OCQ3ABCD1D	05/05/1999	OCQ3
16	99R-00835	OCO3ABCD1	05/05/1999	OCO3
14	99R-00836	OCM3ABCD1	05/05/1999	OCM3
16	99R-01000	OCO1ABCD2	05/10/1999	OCO1
16	99R-01001	OCO1ABCD2-D	05/10/1999	OCO1
13	99R-01205	OCK1ABCD1	05/18/1999	OCK1
13	99R-01206	OCK1ABCD1-D	05/18/1999	OCK1
11	99R-01207	OCI1ABCD1	05/18/1999	OCI1
9	99R-01208	OCG1ABCD1	05/18/1999	OCG1
8	99R-01209	OCE1ABCD1	05/18/1999	OCE11
4	99R-01210	OCC1ABCD1	05/18/1999	OCC1
1	99R-01211	OCA1ABCD1	05/18/1999	OCA1
13	99R-01729	OCK3ABCD1	06/03/1999	OCK3
13	99R-01730	OCK3ABCD1-D	06/03/1999	OCK3
12	99R-01731	OCI3ABCD1	06/03/1999	OCI3
9	99R-01732	OCG3ABCD1	06/03/1999	OCG3
6	99R-01733	OCE3ABCD1	06/03/1999	OCE3
4	99R-01734	OCC3ABCD1	06/03/1999	OCC3
1	99R-01735	OCA3ABCD1	06/03/1999	OCA3
17	99R-01736	OCQ5AD1	06/03/1999	OCQ5
16	99R-01737	OCO5ABD1	06/03/1999	OCO5
15	99R-01738	OCM5ABCD1	06/03/1999	OCM5
15	99R-01739	OCM7ABD1	06/03/1999	OCM7
1	99R-01790	OCA5ABCD1	06/04/1999	OCA5
5	99R-01791	OCC5ABCD1	06/04/1999	OCC5
10	99R-01792	OCG5ABCD1	06/04/1999	OCG5
13	99R-01793	OCK5ABCD1	06/04/1999	OCK5
12	99R-01794	OCI5ABCD1	06/04/1999	OCI5
12	99R-01795	OCI5ABCD1-D	06/04/1999	OCI5
15	99R-01859	OCM7ABD2	06/08/1999	OCM7
15	99R-01860	OCM7ABD2-D	06/08/1999	OCM7
6	99R-01955	OCE5ABCD1	06/13/1999	OCE5
7	99R-01956	OCE5ABCD1-D	06/13/1999	OCE5
14	99R-01957	OCK7ACD1	06/13/1999	OCK7
12	99R-01958	OCI7ABD1	06/13/1999	OCI7
10	99R-01959	OCG7ABCD1	06/13/1999	OCG7
7	99R-01960	OCE7ABCD1	06/13/1999	OCE7
5	99R-01961	OCC7ABCD1	06/13/1999	OCC7
1	99R-01962	OCA7ABCD1	06/13/1999	OCA7
10	99R-01963	OCG9AD1	06/13/1999	OCG9
7	99R-01964	OCE9ABCD1	06/13/1999	OCE9
5	99R-01965	OCC9ABCD1	06/13/1999	OCC9
2	99R-01966	OCA9ABCD1	06/13/1999	OCA9
8	99R-01967	OCE11A1	06/13/1999	OCE11
6	99R-01968	OCC11ABCD1	06/13/1999	OCC11
2	99R-01969	OCA11ABCD1	06/13/1999	OCA11
2	99R-01970	OCA13ABD1	06/13/1999	OCA13
5	99R-02141	OCC7ABCD-2	06/16/1999	OCC7
9	99R-02142	OCE11A-2	06/16/1999	OCE11
6	99R-02143	OCC11ABCD-2	06/16/1999	OCC11
3	99R-02144	OCA13ABD-2	06/16/1999	OCA13
2	99R-02145	OCA11ABCD-2	06/16/1999	OCA11
2	99R-02146	OCA11ABCD-2-D	06/16/1999	OCA11
3	99R-02172	TS-OC-A13-1	06/17/1999	OCA13
3	99R-02173	TS-OC-A13-2	06/17/1999	OCA13
3	99R-02174	TS-OC-A13-3	06/17/1999	OCA13
7	99R-02205	OCE5ABCD-2	06/18/1999	OCE5
7	99R-02206	OCE5ABCD-2-D	06/18/1999	OCE5
8	99R-02207	OCE9ABCD-2	06/18/1999	OCE9
10	99R-02208	OCG7ABCD-2	06/18/1999	OCG7
11	99R-02209	OCG9AD-2	06/18/1999	OCG9
14	99R-02210	OCK7ACD-2	06/18/1999	OCK7

435-02 - ASARCO, Tacoma Smelter ANALYSES SUMMARY REPORT

INDEX

Sample Type: Soil

SITE CODE	OCA1	OCA3	OCA5	OCA7
SAMPLE DATE	05/18/1999	06/03/1999	06/04/1999	06/13/1999
SAMPLE TIME	14:40	13:30	9:22	11:30
LAB	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01211	99R-01735	99R-01790	99R-01962
TYPE	XRF	XRF	XRF	XRF
DEPTH	1.5	1.5	1.5	1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCA1ABCD1	OCA3ABCD1	OCA5ABCD1	OCA7ABCD1
-- METALS & MINOR CONSTITUENTS --				
ARSENIC (AS) TOT	139.0	167.0	165.0	49.0
LEAD (PB) TOT	134.0	193.0	183.0	66.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCA9	OCA11	OCA11	OCA11	OCA13
SAMPLE DATE	06/13/1999	06/13/1999	06/16/1999	06/16/1999	06/13/1999
SAMPLE TIME	12:10	12:40	16:50	16:50	12:50
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01966	99R-01969	99R-02145	99R-02146	99R-01970
REMARKS				DUPLICATE	
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	1.5	1.5	2.0		1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCA9ABCD1	OCA11ABCD1	OCA11ABCD-2	OCA11ABCD-2-D	OCA13ABD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	211.0	852.0	227.0	214.0	3678.0
LEAD (PB) TOT	304.0	595.0	209.0	258.0	2058.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCA13	OCA13	OCA13	OCA13	OCA13	OCA13	OCA13
SAMPLE DATE	06/16/1999	06/17/1999	06/17/1999	06/17/1999	06/21/1999	06/22/1999	06/23/1999
SAMPLE TIME	16:45	13:07	13:10	13:15	11:00	12:30	9:15
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-02144	99R-02172	99R-02173	99R-02174	99R-02239	99R-02301	99R-02343
TYPE	XRF	XRF	XRF	XRF	XRF	XRF	XRF
DEPTH	2.0				3.0	5.0	7.0
OTHER INFO	Exc. Depth				Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCA13ABD-2	TS-OC-A13-1	TS-OC-A13-2	TS-OC-A13-3	OCA13ABD-3	OCA13ABD-4	OCA13ABD-5
-- METALS & MINOR CONSTITUENTS --							
ARSENIC (AS) TOT	1691.0	296.0	74.0	177.0	1436.0	680.0	27.0
LEAD (PB) TOT	255.0	120.0	107.0	106.0	362.0	257.0	40.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCA13	OCA13	OCC1	OCC3
SAMPLE DATE	06/23/1999	06/23/1999	05/18/1999	06/03/1999
SAMPLE TIME		9:15	14:35	13:50
LAB	TSC-SLC	RUSTON	RUSTON	RUSTON
LAB NUMBER	1999-5055	99R-02344	99R-01210	99R-01734
REMARKS	SPLIT	DUPLICATE		
TYPE	WETCHEM	XRF	XRF	XRF
DEPTH			1.5	1.5
OTHER INFO			Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCA13ABD-5-D	OCA13ABD-5-D	OCC1ABCD1	OCC3ABCD1
-- METALS & MINOR CONSTITUENTS --				
ARSENIC (AS) TOT	22.0	24.0	14.0	128.0
LEAD (PB) TOT	41.0	49.0	20.0	219.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCC5	OCC7	OCC7	OCC9
SAMPLE DATE	06/04/1999	06/13/1999	06/16/1999	06/13/1999
SAMPLE TIME	9:36	11:20	16:25	12:00
LAB	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01791	99R-01961	99R-02141	99R-01965
TYPE	XRF	XRF	XRF	XRF
DEPTH	1.5	1.5	2.0	1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCC5ABCD1	OCC7ABCD1	OCC7ABCD-2	OCC9ABCD1
-- METALS & MINOR CONSTITUENTS --				
ARSENIC (AS) TOT	190.0	290.0	133.0	198.0
LEAD (PB) TOT	282.0	521.0	215.0	164.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCC11	OCC11	OCC11	OCB3	OCB5
SAMPLE DATE	06/13/1999	06/16/1999	06/21/1999	06/03/1999	06/13/1999
SAMPLE TIME	12:30	16:40	11:10	14:10	10:30
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01968	99R-02143	99R-02240	99R-01733	99R-01955
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	1.5	2.0	3.0	1.5	1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCC11ABCD1	OCC11ABCD-2	OCC11ABCD-3	OCB3ABCD1	OCB5ABCD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	858.0	399.0	78.0	72.0	337.0
LEAD (PB) TOT	750.0	487.0	79.0	75.0	301.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCB5	OCB5	OCB5	OCB7	OCB9
SAMPLE DATE	06/13/1999	06/18/1999	06/18/1999	06/13/1999	06/13/1999
SAMPLE TIME	10:30	8:30	8:30	11:10	11:50
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01956	99R-02205	99R-02206	99R-01960	99R-01964
REMARKS	DUPLICATE		DUPLICATE		
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH		2.0		1.5	1.5
OTHER INFO		Exc. Depth		Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCB5ABCD1-D	OCB5ABCD-2	OCB5ABCD-2-D	OCB7ABCD1	OCB9ABCD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	347.0	68.0	79.0	140.0	258.0
LEAD (PB) TOT	269.0	205.0	113.0	353.0	465.0
		J4	J4		

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCE9	OCE9	OCE9	OCE11	OCE11	OCE11
SAMPLE DATE	06/18/1999	06/21/1999	06/21/1999	05/18/1999	06/13/1999	06/13/1999
SAMPLE TIME	8:45	11:30	11:30	14:30		12:20
LAB	RUSTON	RUSTON	RUSTON	RUSTON	TSC-SLC	RUSTON
LAB NUMBER	99R-02207	99R-02242	99R-02243	99R-01209	1999-5054	99R-01967
REMARKS			DUPLICATE		SPLIT	
TYPE	XRF	XRF	XRF	XRF	WETCHEM	XRF
DEPTH	2.0	3.0		1.5		1.5
OTHER INFO	Exc. Depth	Exc. Depth		Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCE9ABCD-2	OCE9ABCD-3	OCE9ABCD-3-D	OCE1ABCD1	OCE11A1	OCE11A1
-- METALS & MINOR CONSTITUENTS --						
ARSENIC (AS) TOT	2193.0	11.0	< 10.0	76.0	1658.0	1937.0
LEAD (PB) TOT	1719.0	10.0	< 10.0	94.0	1021.0	1014.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCE11	OCE11	OCE11	OCG1	OCG3
SAMPLE DATE	06/16/1999	06/21/1999	06/22/1999	05/18/1999	06/03/1999
SAMPLE TIME	16:35	11:20	13:50	14:25	14:20
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-02142	99R-02241	99R-02339	99R-01208	99R-01732
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	2.0	3.0	5.0	1.5	1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCE11A-2	OCE11A-3	OCE11A-4	OCG1ABCD1	OCG3ABCD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	521.0	369.0	< 20.0	46.0	152.0
LEAD (PB) TOT	591.0	465.0	< 20.0	46.0	140.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCG5	OCG7	OCG7	OCG7	OCG9
SAMPLE DATE	06/04/1999	06/13/1999	06/18/1999	06/21/1999	06/13/1999
SAMPLE TIME	9:49	11:00	8:55	11:40	11:40
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01792	99R-01959	99R-02208	99R-02244	99R-01963
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	1.5	1.5	2.0	3.0	1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCG5ABCD1	OCG7ABCD1	OCG7ABCD-2	OCG7ABCD-3	OCG9AD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	126.0	286.0	405.0	134.0	532.0
LEAD (PB) TOT	210.0	324.0	380.0	154.0	415.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCG9	OCG9	OCG9	OCG9	OCI1
SAMPLE DATE	06/18/1999	06/21/1999	06/22/1999	06/22/1999	05/18/1999
SAMPLE TIME	9:10	11:50	13:55	13:55	14:20
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-02209	99R-02245	99R-02340	99R-02341	99R-01207
REMARKS				DUPLICATE	
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	2.0	3.0	5.0		1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCG9AD-2	OCG9AD-3	OCG9AD-4	OCG9AD-4-D	OCI1ABCD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	239.0	294.0	26.0	34.0	91.0
LEAD (PB) TOT	211.0	< 10.0	32.0	31.0	23.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCI3	OCI5	OCI5	OCI7
SAMPLE DATE	06/03/1999	06/04/1999	06/04/1999	06/13/1999
SAMPLE TIME	14:25	10:02	10:02	10:50
LAB	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01731	99R-01794	99R-01795	99R-01958
REMARKS			DUPLICATE	
TYPE	XRF	XRF	XRF	XRF
DEPTH	1.5	1.5		1.5
OTHER INFO	Exc. Depth	Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCI3ABCD1	OCI5ABCD1	OCI5ABCD1-D	OCI7ABD1
-- METALS & MINOR CONSTITUENTS --				
ARSENIC (AS) TOT	129.0	39.0	44.0	199.0
LEAD (PB) TOT	219.0	68.0	64.0	172.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCK1	OCK1	OCK3	OCK3	OCK5
SAMPLE DATE	05/18/1999	05/18/1999	06/03/1999	06/03/1999	06/04/1999
SAMPLE TIME	14:10	14:15	14:35	14:35	10:14
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01205	99R-01206	99R-01729	99R-01730	99R-01793
REMARKS		DUPLICATE		DUPLICATE	
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	1.5		1.5		1.5
OTHER INFO	Exc. Depth		Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCK1ABCD1	OCK1ABCD1-D	OCK3ABCD1	OCK3ABCD1-D	OCK5ABCD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	49.0	60.0	173.0	220.0	22.0
LEAD (PB) TOT	46.0	54.0	153.0	150.0	19.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCK7	OCK7	OCM1	OCM3
SAMPLE DATE	06/13/1999	06/18/1999	05/03/1999	05/05/1999
SAMPLE TIME	10:40	9:20	14:50	11:35
LAB	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01957	99R-02210	99R-00772	99R-00836
TYPE	XRF	XRF	XRF	XRF
DEPTH	1.5	2.0	1.5	1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth	Exc. Depth
SAMPLE NUMBER	OCK7ACD1	OCK7ACD-2	OCM1ABCD1	OCM3ABCD1
-- METALS & MINOR CONSTITUENTS --				
ARSENIC (AS) TOT	462.0	11.0	169.0	126.0
LEAD (PB) TOT	299.0	13.0	153.0	125.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCM5	OCM7	OCM7	OCM7	OCO1
SAMPLE DATE	06/03/1999	06/03/1999	06/08/1999	06/08/1999	05/03/1999
SAMPLE TIME	16:15	16:30	9:25	9:25	14:30
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-01738	99R-01739	99R-01859	99R-01860	99R-00770
REMARKS				DUPLICATE	
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	1.5	1.5	2.0		1.5
OTHER INFO	Exc. Depth	Exc. Depth	Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCM5ABCD1	OCM7ABD1	OCM7ABD2	OCM7ABD2-D	OCO1ABCD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	136.0	359.0	122.0	132.0	282.0
LEAD (PB) TOT	173.0	437.0	139.0	151.0	178.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OC01	OC01	OC01	OC03	OC05
SAMPLE DATE	05/03/1999	05/10/1999	05/10/1999	05/05/1999	06/03/1999
SAMPLE TIME	14:35	16:15	16:15	11:25	16:00
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-00771	99R-01000	99R-01001	99R-00835	99R-01737
REMARKS	DUPLICATE		DUPLICATE		
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH		2.0		1.5	1.5
OTHER INFO		Exc. Depth		Exc. Depth	Exc. Depth
SAMPLE NUMBER	OC01ABCD1-D	OC01ABCD2	OC01ABCD2-D	OC03ABCD1	OC05ABD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	292.0	13.0	11.0	228.0	50.0
LEAD (PB) TOT	189.0	< 10.0	12.0	59.0	65.0

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

Sample Type: Soil

SITE CODE	OCQ1	OCQ1	OCQ3	OCQ3	OCQ5
SAMPLE DATE	04/29/1999	04/29/1999	05/05/1999	05/05/1999	06/03/1999
SAMPLE TIME	9:15	9:20	11:10	11:15	15:45
LAB	RUSTON	RUSTON	RUSTON	RUSTON	RUSTON
LAB NUMBER	99R-00651	99R-00652	99R-00833	99R-00834	99R-01736
REMARKS		DUPLICATE		DUPLICATE	
TYPE	XRF	XRF	XRF	XRF	XRF
DEPTH	1.5		1.5		1.5
OTHER INFO	Exc. Depth		Exc. Depth		Exc. Depth
SAMPLE NUMBER	OCQ1ABCD1	OCQ1ABCD1-D	OCQ3ABCD1	OCQ3ABCD1D	OCQ5AD1
-- METALS & MINOR CONSTITUENTS --					
ARSENIC (AS) TOT	41.0	42.0	169.0	181.0	77.0
LEAD (PB) TOT	46.0	64.0	186.0	267.0	78.0
			J4	J4	

NOTES: All results in mg/L (Water) or mg/kg (Soil) unless noted and are laboratory (LAB) unless field (FLD) or calculated (CALC)
TOT:Total; DIS:Dissolved; TRC:Total Recoverable; E:Estimated; <:Less Than Detect. Blank: parameter not tested
Validation Flags: A:Anomalous; UJ1:Blank; J2,UJ2: Standard; J3:Hold Time; J4,UJ4:Duplicate, Spike, or Split Exceedance;
R:Rejected.

APPENDIX D

Assessment and Repair of Runoff Damaged OCF Liners

Hydrometrics, Inc.®
consulting scientists and engineers

MEMORANDUM

DATE: September 17, 2001

TO: Sue O'Neill

FROM: Dennis Walden / Dave Cameron

SUBJECT: ASSESSMENT AND REPAIR OF RUNOFF DAMAGED OCF LINERS

Introduction

Prior to the completion of the all the liners in the On-Site Containment Facility (OCF), an above average (approximate 33 year return period) rain event occurred. As a consequence, an undetermined amount of precipitation runoff infiltrated beneath the upper, or primary, Flexible Membrane Liner (FML), and had affected an unknown amount of the clay foundation layer and Geosynthetic Clay Liner (GCL) in the bottom of the OCF. During the course of investigating the remedy and potential repairs to the GCL and clay foundation layer, it was discovered that precipitation runoff had also infiltrated beneath the lower, or secondary FML liner. This memorandum will describe the condition of the OCF prior to the rain event, the damage discovered during the assessment and investigation, the infiltration mechanism, and measures taken to repair the liners.

Description

The liners above the lower FML of the OCF were finished to where most of the eastern face of the OCF had not been covered with GCL and the upper (primary) FML liners, leaving the geocomposite drainage layer exposed. In anticipation of predicted precipitation, the geocomposite had been covered with plastic sheeting, and the north access ramp (North Ramp) was prepared to shed precipitation. GCL and the upper FML liners had been placed in the bottom of the OCF. However, the GCL and FML liners only extended up the eastern face of the OCF, over the geocomposite with lengths ranging from approximately three to ten feet **(Photos 1 & 2)**. The configuration of the primary and secondary liners, location of the North Ramp, and areas requiring repair are illustrated on **Figure 1.**

Over a period of three days, starting on Tuesday, August 21, 2001, approximately 3.5 inches of precipitation were recorded at the site. Although a majority of the precipitation that fell was collected and discharged from the surface of the upper FML through a pump in the Leachate Collection and Removal System (LCRS), an undetermined amount of runoff infiltrated beneath the upper FML. Initially, evidence was not observed, nor was it contemplated, that runoff had infiltrated beneath the lower FML. The runoff beneath the upper FML was contained in the drainage layer and sump area of the Leachate Detection, Collection and Removal system (LDCRS).

The observed infiltration areas appeared to have been focused near the bottom of the north access ramp, and along the toe of the eastern face of the OCF, down gradient of the geocomposite drainage layer that had been covered with plastic sheeting.

Observations made on August 22, 2001, indicated that significant runoff had entered the LDCRS, and created uplift forces below the upper FML and GCL liners causing the liners and dewatering pump to float in the sump area **(Photo 3)**. A relief hole was cut in the liners at the sump in order to evacuate the water from the LDCRS sump and drainage layer **(Photo 4)**. This action was taken to minimize the level of water accumulating in the LDCRS and cell bottom. The attached **Detail 1** illustrates a cross section through the sump, the location where flotation of the liners occurred, and the location of the relief holes. A submersible pump with a capacity of approximately 15 gpm was installed within the LDCRS sump access pipe to pump water from the LDCRS. The combination of the surface pump, and the pump in the LDCRS sump, effectively removed the runoff water from beneath the upper FML and GCL liners. Subsequent precipitation was adequately discharged through the pumps and precluded further flotation of the upper FML and GCL liners.

Installation of the OCF liner system and construction of the ramp into the cell at the southwest corner required that temporary access into the cell be provided during liner installation. This was accomplished by leaving a portion of the cell unlined (North Ramp) to provide temporary access into the cell at the location illustrated on **Figure 1**. Placement of the secondary FML had been completed on the slopes adjacent to the North Ramp, although the FML was terminated at the edges of the ramp. Granular road base was placed on subgrade as the ramp surface, and temporary plastic sheets that could be pulled over the ramp as a rain cover were embedded along the edges of the ramp. A typical cross section showing the liner configuration along the North Ramp is presented on **Detail 2**.

During active precipitation on the afternoon of Wednesday, August 22, 2001, a tracing dye (Rhodamine WT) was poured into the runoff entering the vertical interface between the lower FML and the temporary plastic cover enveloping the access road base material as depicted on **Detail 2**. The dye injection point was approximately forty linear feet upgradient of elevation 30 in the unlined area of the North Ramp. The dye was used to determine if the observed runoff from the lower FML was flowing above or below the upper FML. Evidence of the dye was not observed in either the surface runoff collecting above the upper FML, or in the outflow from the pump located in the LDCRS sump. It is assumed the nature of the suspended bentonite that was observed in water evacuated from the LCDRS may have obscured observation of the tracing dye.

The wet condition of the surface soils around the OCF embankment crest prevented any activities from occurring on Thursday and Friday, August 23 and 24, 2001. However, plans were formulated to remediate suspected damage.
Late Friday afternoon, it became apparent that a significant volume of water was trapped below the lower FML liner along the toe of the east slope near the LCRS sump, and at the lower portion of the slope above the sump. This observation indicated that runoff had infiltrated between the CCL and secondary FML as depicted on **Detail 3**. As a consequence, the focus of the repairing the clay foundation layer and GCL beneath the upper FML, planned to take place on Saturday, was shifted to the investigation and assessment of the CCL and lower FML liners. Parties who had previously been involved were notified of the development, and plans were made to convene on site Saturday, August 25, 2001.

Potential Consequences of Infiltration

Due to the configuration of the OCF cell bottom, the area adversely affected by the infiltration of the runoff beneath the upper FML was suspected to be limited to the region in the near vicinity of the sump, and along the toe of the eastern face of the OCF, which is the catch line of the OCF berm and cell bottom.

The GCL is the impermeable liner component that would have been adversely affected due to its propensity to hydrate. The effectiveness of the GCL would be compromised if it is hydrated without a confining load. There were areas of the GCL liner that were suspected to have become completely hydrated and would require replacement.

The clay soil layer, which was placed above the LDCRS gravel drain layer and is overlaid with GCL, serves primarily as a foundation layer. Areas of the clay foundation layer that had became saturated, likely suffered a reduction of shear strength. In areas where it had lost its shear strength and would not be expected to support the anticipated overburden loads, the clay soil would be replaced.

Extensive wetting of the CCL beneath the lower FML could impact the function of the liner, and the extent of wetting should be known. It would be necessary to expose those areas of the CCL by cutting inspection holes through both the upper and lower FML liners where the runoff had flowed or ponded.

Inspections

On Saturday, August 25, 2001, Lucky Tabor of Envirocon (contractor), Alan Whipple and Kirk Lilleskare of Northwest Linings (sub-contractor to Envirocon), Kevin Rochlin of EPA, Tami Thomas and Don Anderson of CH2M Hill, and Dennis Walden, Jeff Cross, and Dave Cameron of Hydrometrics, inspected and assessed the condition of the OCF liners.

In order to inspect and replace the GCL and clay foundation layer, previously placed FML had to be laid back. The liner contractor determined the best methods of exposing the GCL and clay foundation layer.

The upper FML was pulled back to expose the GCL, and portions of hydrated GCL were removed (see **Figure 1**) to expose the surface of the clay foundation layer **(Photos 5, 6 & 7)**. In areas where the runoff had flowed or ponded, the GCL appeared to be partially to fully hydrated, and the surface of the clay foundation layer was saturated. Using a shovel where the runoff had ponded, the depth of moisture penetration into the clay foundation layer was approximately 1-1/2 inches where the material had been compacted with a drum roller, but through the entire depth of the material at its tapered edge where the layer abuts the eastern slope. These results were not unexpected because of the limited compaction effort that was applied along the edges when the clay foundation layer was placed.

Approximately sixty feet upgradient from the sump area and extending approximately ninety feet to the bottom of the North Ramp access road, erosion rills were observed in the surface of the clay foundation layer, however, the clay was not saturated to any depth **(Photo 8)**.

After inspecting and assessing the condition of the clay foundation layer, a relief hole was cut into the lower FML **(Photo 9)**. The location of the relief hole is illustrated on **Detail 3**. An undetermined amount of entrapped runoff water was allowed to flow into the sump where it was pumped to the tank of a water truck. The runoff water was turbid with suspended solids, and evidence of the tracing dye was not observed. Samples of the runoff water were collected to determine if the dye would be evident after the solids settled out.

Once the majority of runoff water had been evacuated from beneath the lower FML, the CCL was inspected. Four inspection holes were cut through the lower FML to examine the CCL **(Photo 10)**. At three of the inspection locations where the CCL had been inundated, the CCL was saturated and had lost shear strength through depths ranging from 1/2 inch to 1-1/2 inches **(Photo 11)**. The depths of saturated CCL appeared to be dependent upon the length of time it was exposed to the entrapped runoff water, and activities such as foot traffic on the lower FML while the entrapped runoff water was present. Some saturated CCL was removed with a shovel to confirm the proximity of competent CCL beneath the surface **(Photo 12)**. The fourth inspection hole was cut into the invert of the southeast groin to assure that there had not been a seam failure that allowed the runoff beneath the lower FML. The CCL at this location had not been exposed to runoff, and its condition appeared to be as it had been just prior to being covered by the lower FML **(Photo 13)**.

The source of the runoff beneath the lower FML was undetermined until the north access ramp was dismantled in the area of the liner termination near elevation 30. Unfortunately, the temporary configuration of lower FML liner, the ramp's temporary plastic covers, and the road mix that was place in the road, directed runoff beneath the lower FML. Evidence of the this fact was made obvious by the erosion rill along the face of the access road embankments that was left in the native soil underlying the CCL. The road base material and temporary plastic used to cover the ramp prevented infiltration of the runoff into the subgrade, forcing the water to travel along the interface of the subgrade and CCL **(Photo 14)**. The area of the erosion rill will be repaired when construction of the 3 foot thick CCL is constructed on the North Ramp.

Repair

Subsequent to the inspection and assessment of the affected CCL, the representatives from the EPA, CH2M Hill, and Hydrometrics convened to discuss repair alternatives.

Several alternatives for treating the saturated CCL beneath the lower FML were discussed, including exposure and replacement, forced-air drying, and no action. Consideration was given to the limited area that was affected, the competency of the underlying unaffected CCL, the benefits derived from the different alternatives, and the potential of exposing undamaged CCL to adverse weather during the time required to complete the repairs. The conclusion reached by all parties was to leave the CCL undisturbed allowing excess moisture still present to equilibrate, and that the liner would function as expected without adversely compromising its effective impermeability or strength.

The fully hydrated GCL was removed. However, it was decided by all parties to leave the remaining partially hydrated GCL in place and overlay it with new GCL. The new GCL overlaps the remaining GCL, and extends five feet beyond the area of existing GCL where the clay of the GCL exhibited granular properties. **Photo 15** illustrates the extent of the area were the GCL was replaced and overlapped.

The clay foundation layer below the GCL required additional assessment. Runoff water that had been entrapped beneath the lower FML created a hydrostatic force that displaced the FML and overlying clay foundation layer. During evacuation of the runoff water from beneath the lower FML, the displaced FML and clay foundation layer returned to its near original configuration causing full depth tension cracks in the clay that had become saturated **(Photo 16)**. The clay foundation layer in this location obviously required repair.

The hydrated clay in the sump and along the toe of the east berm was remove by hand and discarded **(Photo 17)**. The separation fabric below the clay was removed to allow the gravel in the sump to be inspected and re-leveled **(Photo 18)**. The clay was replaced in the sump, along the toe of the east berm, and for about fifteen feet north of the sump. The clay was placed using three inch lifts, compacted with a hand operated, engine-driven vibratory plate, and reshaped to near its preexisting contours **(Photos 19 & 20)**. Final layer thickness was measured by GPS. The compaction effort appeared to be adequate and no soft spots were observed in the sump or elsewhere on the floor of the OCF.

Erosion rills in the clay foundation layer along the toe of the east berm **(Photo 8)** were repaired with compacted bentonite amended soil.

The following is a excerpt from a memorandum, with editorial notations, to Dennis Walden from Ray Womack, dated September 7, 2001. Excerpted text in italics:

[During the repair of the sump], *it appeared that the bottom inch or so of the primary clay liner had been hydrated by water pressure in the underlying gravel over a large area. This small thickness of hydration was not judged to be problematical and the clay liner was not removed inboard of the cracked and fully hydrated zone. Two test pits were excavated by Dennis Walden, Ray Womack, and others on the afternoon of August 27 at the locations shown on the figure* [**Figure 1**]. *The pits encountered compacted clay fill described as follows: pale yellowish-brown, moist, very stiff, plastic, clayey sand, with scattered rounded gravel to about ½-inch diameter. The fill is 1.2-ft thick at TP-1 and 0.85-ft thick at TP-2, underlain by geotextile. The clay was not wet and no softened material was observed. The clay appeared to be well compacted and undamaged. After consultation with Mike Oelrich, it was agreed that the small area adjacent to the hydrated and cracked zone where the bottom inch of clay had become wet was of no significance regarding strength or settlement potential.*

The termination of the lower FML in the north access road was reconfigured to incorporate a cutoff membrane in order to minimize the future occurrence of runoff infiltrating beneath the lower FML liner or into the LDCRS. The location of the cutoff is illustrated on **Figure 1**, and its configuration is illustrated on **Detail 4**. The cutoff membrane extends two feet into the subgrade and sidewalls of the North Ramp access road, is backfilled with bentonite amended soil, and is welded to adjoining FML liners. This will ensure that the resulting flow path will preclude infiltration beneath the lower FML, and prevent surface runoff from flowing directly beneath the lower FML **(Photos 21, 22, 23, 24 & 25)**.

Post Repair

After the required repairs were made, installation of the primary GCL and FML liners proceeded. Subsequent to placing and seaming the upper FML, rain showers occurred from September 1-3, 2001. Although the precipitation was not significant, it appeared that the north access road runoff was adequately controlled and directed above the upper FML, and no evidence was observed that runoff water had infiltrated beneath the lower FML.

Provided runoff is adequately controlled and infiltration paths are effectively eliminated, any seepage entering the LDCRS sump will be adequately handled by the submersible pump currently installed. This pump will need to be maintained in the LDCRS sump until the time when the north access road is no longer required and the entire OCF liner system is completed. Runoff that collects above the primary liner will continue to be evacuated from the OCF through a submersible pump located in the LCRS sump.

cc: Randy Snyder, Gordy Dicks, Ray Womack, Frank Greguras

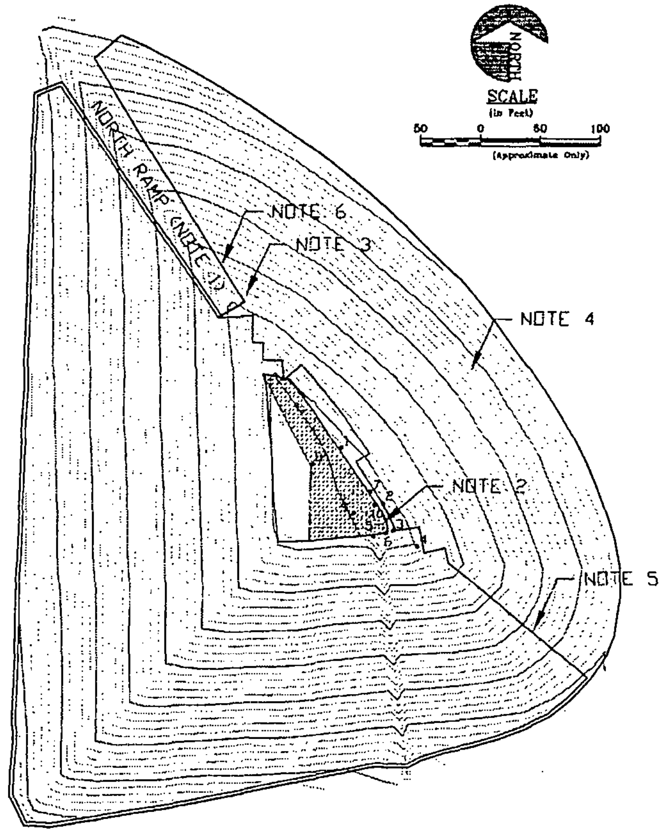

FIGURE 1 - OCF SITE MAP AND LINER ASBUILT

NOTES:
1. NORTH RAMP AREA SECTION PRESENTED ON DETAIL 2.
2. SUMP AREA SECTION PRESENTED ON DETAILS 1 AND 3.
3. LOCATION OF NORTH RAMP CUTOFF.
4. EAST SLOPE COVERED WITH TEMPORARY PLASTIC COVER.
5. APPROXIMATE LIMITS OF PRIMARY FML INSTALLED ON 8-20-01.
6. LOCATION OF TRACING DYE APPLICATION.
7. SOIL CAPACITY EXCEEDED CAPACITY OF SHEAR TESTING DEVICE.

POINT NO.	DESCRIPTION	COMMENT
1	SLWOP4	CCL WETTED APPROXIMATELY 0.5 INCHES
2	SLWOP3	CCL WETTED APPROXIMATELY 0.5-1.0 INCHES
3	SLWOP2	CCL WETTED APPROXIMATELY 1-1.5 INCHES
4	SLWOP1	NONIMPACTED CCL
5	SLWRP1	WATER RELIEF POINT, SECONDARY FML
6	SLWRP2	WATER RELIEF POINT, SECONDARY FML
7	SLWRP3	WATER RELIEF POINT, SECONDARY FML
8	TORVANE1	FOUNDATION LAYER TOREVANE TEST
9	TORVANE2	FOUNDATION LAYER TOREVANE TEST
10	TORVANE3	FOUNDATION LAYER TOREVANE TEST

LEGEND:

LIMITS OF SECONDARY FML (8-20-01)

LIMITS OF PRIMARY FML (8-20-01)

CELL BOTTOM AREA

GCL OVERLAP LINE

WET GCL REMOVAL AREA

GCL REPLACEMENT AND OVERLAP AREA

SURVEY POINT IDENTIFICATION 10

ASSESSMENT AND REPAIR OF RUNOFF DAMAGED LINER	OCF LINER INSTALLATION AUGUST 20, 2001	FIGURE 1

UPDATE TIME:
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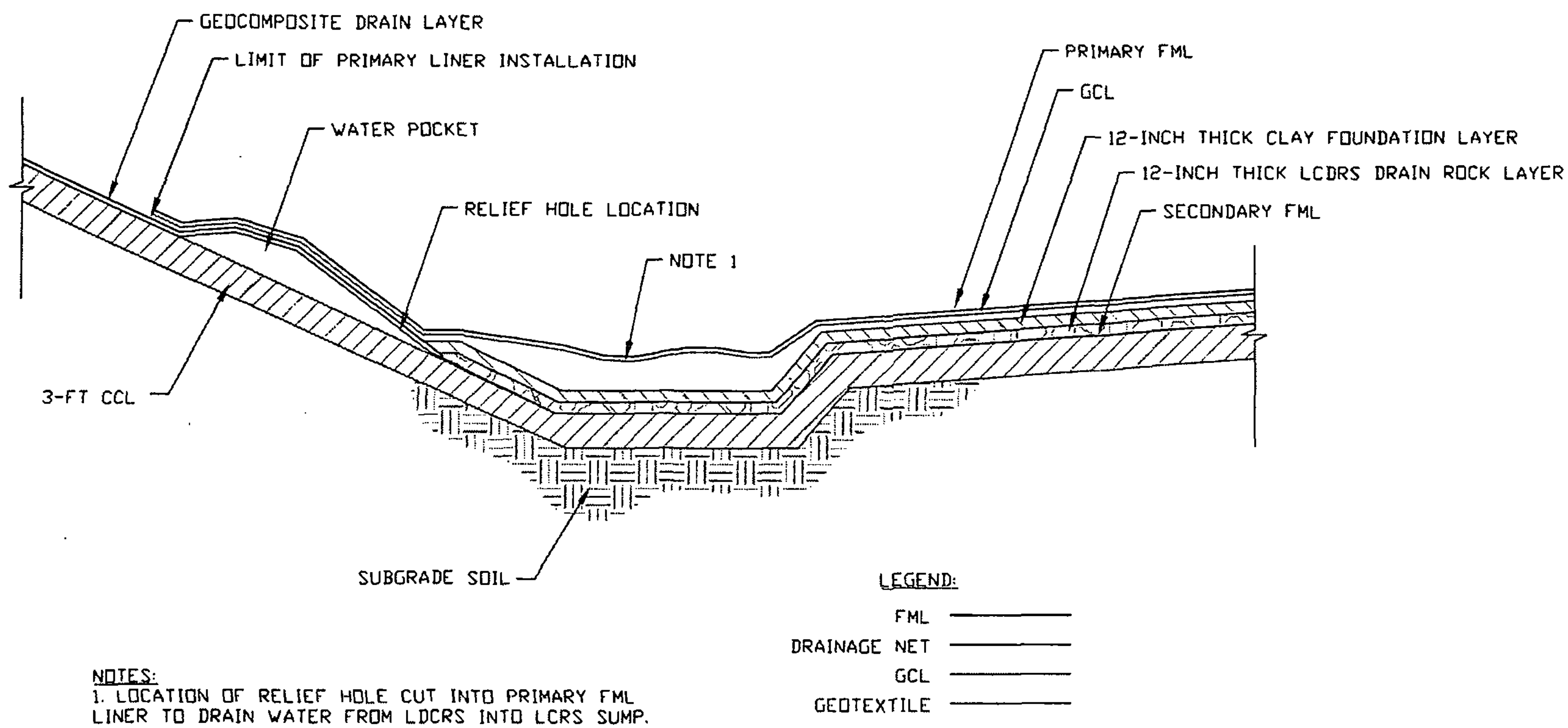

NOTES:
1. LOCATION OF RELIEF HOLE CUT INTO PRIMARY FML LINER TO DRAIN WATER FROM LDCRS INTO LCRS SUMP.

DETAIL 1 - OCF SUMP SECTION (LOOKING SOUTH)

(N.T.S.)

ASSESSMENT AND REPAIR OF RUNOFF DAMAGED OCF LINERS	OCF SUMP SECTION LOOKING SOUTH	DETAIL 1

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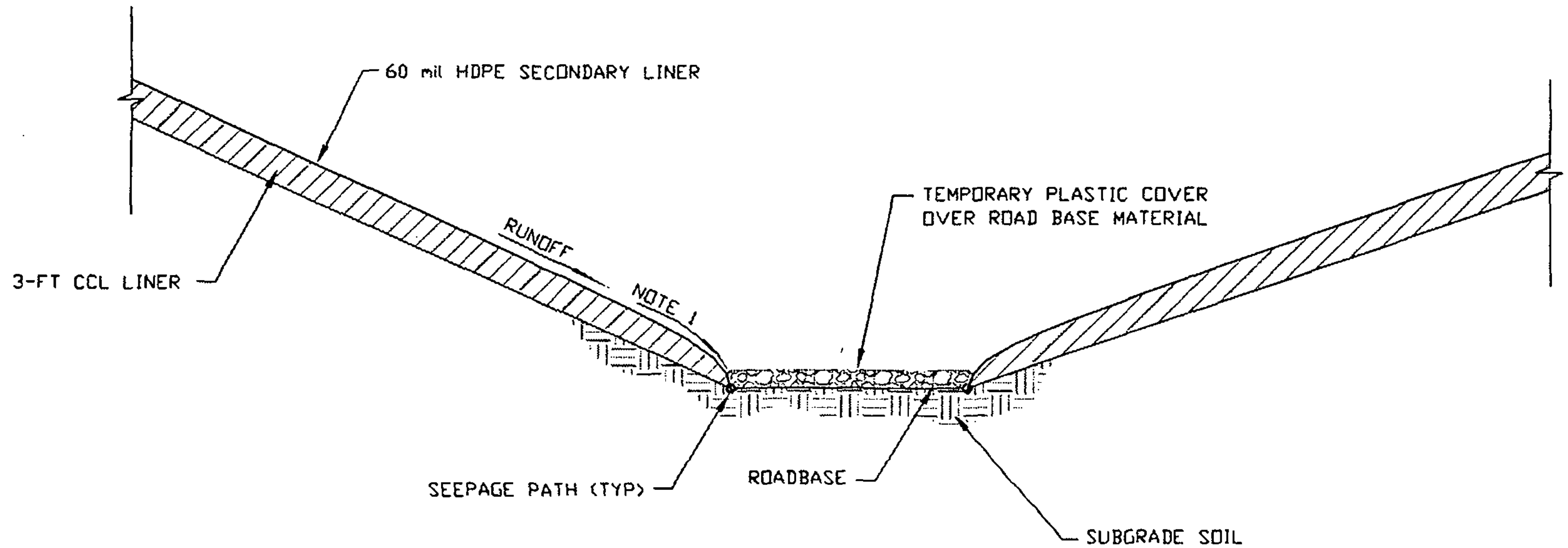

LEGEND:
FML
TEMPORARY PLASTIC COVER

NOTES:
1. LOCATION OF TRACING DYE APPLICATION.

DETAIL 2 - NORTH RAMP SECTION (LOOKING SOUTH)
(N.T.S.)

ASSESSMENT AND REPAIR OF RUNOFF DAMAGED OCF LINERS	NORTH RAMP SECTION LOOKING SOUTH	DETAIL 2

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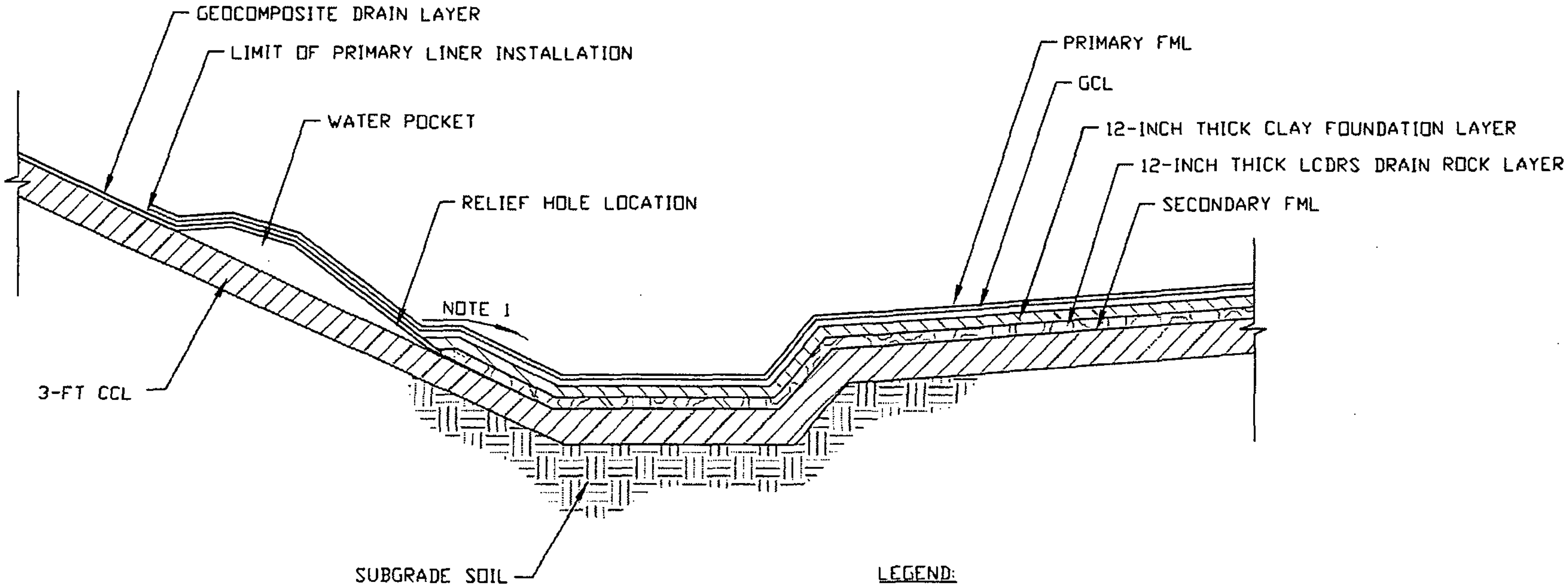

LEGEND:

FML

DRAINAGE NET

GCL

GEOTEXTILE

NOTES:
1. LOCATION OF RELIEF HOLE CUT INTO SECONDARY FML LINER TO DRAIN WATER POCKET INTO SUMP.

DETAIL 3 - OCF SUMP SECTION (LOOKING SOUTH)

(N.T.S.)

ASSESSMENT AND REPAIR OF RUNOFF OF RUNOFF DAMAGED OCF LINERS	OCF SUMP SECTION LOOKING SOUTH	DETAIL 3

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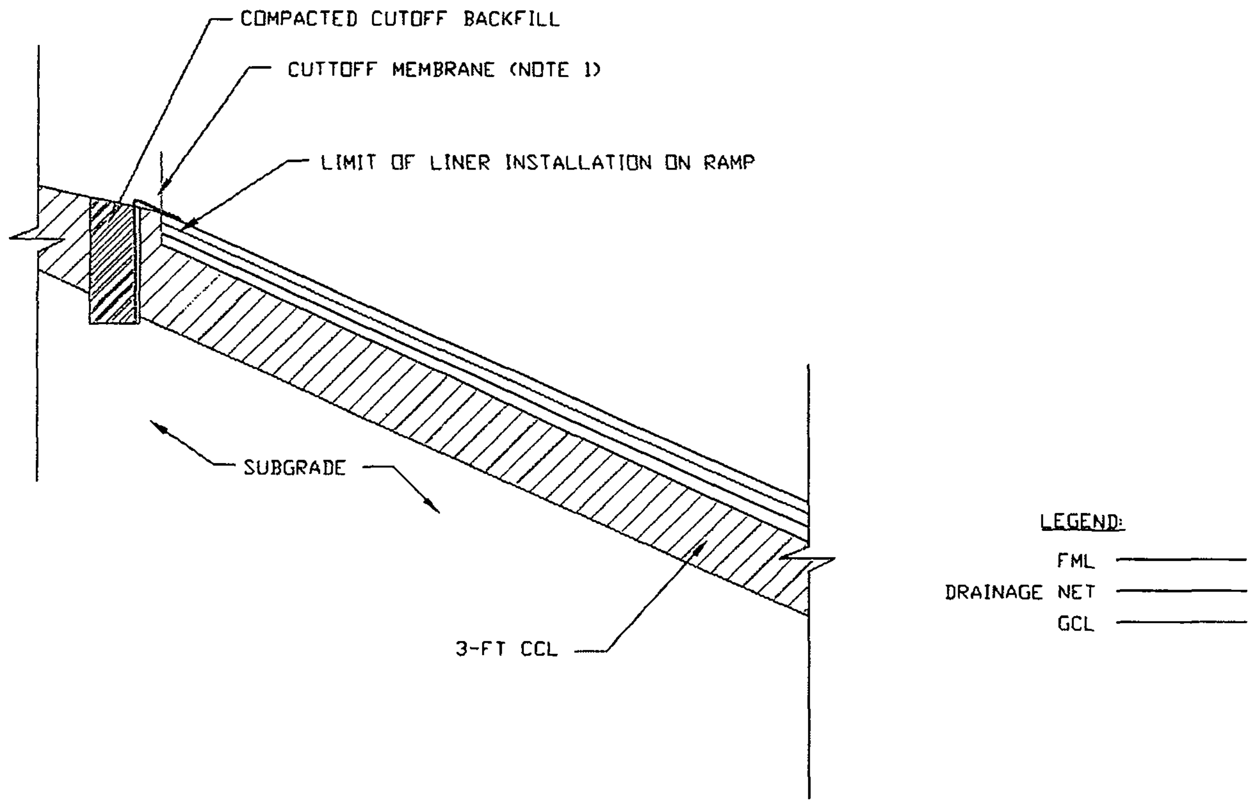

NOTES:
1. CUTOFF MEMBRANE FOLDED OVER AND EXTRUSION WELDED TO PRIMARY FML ALONG BOTTOM AND SIDES.

DETAIL 4 - NORTH RAMP CUTOFF (LLOKING EAST)

(N.T.S.)

ASSESSMENT AND REPAIR OF RUNOFF DAMAGED OCF LINERS	OCF NORTH RAMP CUTOFF LOOKING EAST (ELEVATION 30-FT)	DETAIL 4

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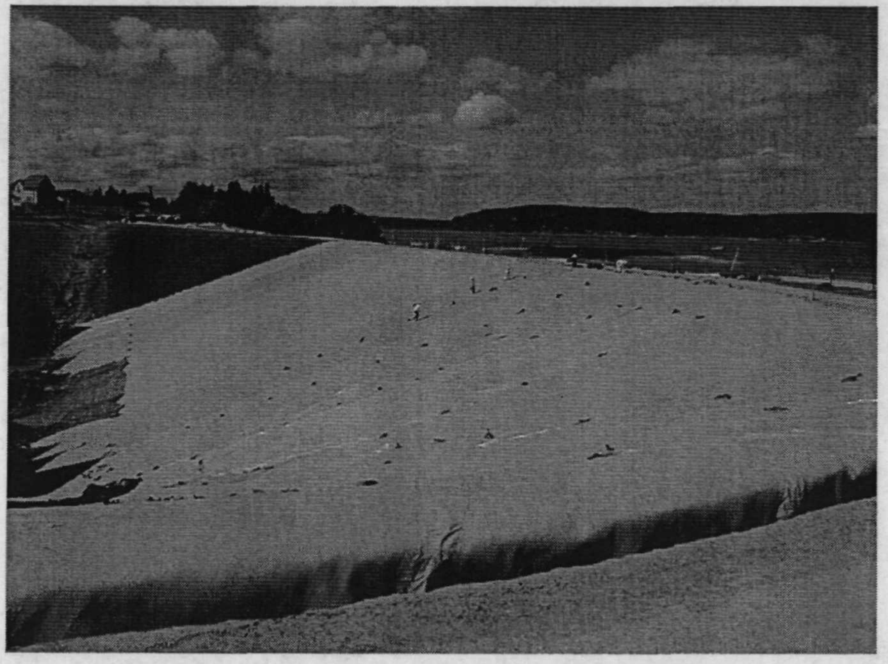

Photo 1 – Status of OCF August 20, 2001

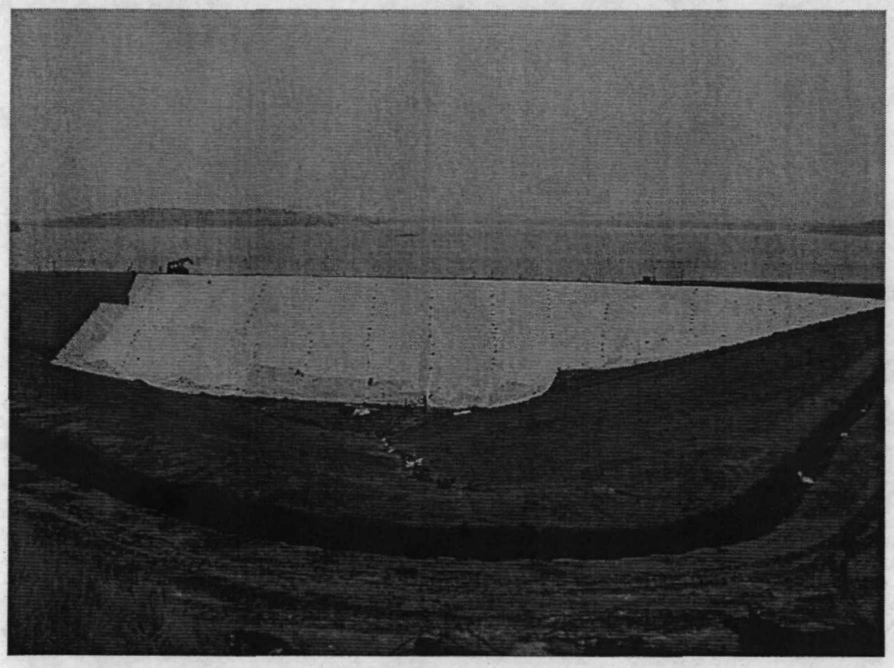

Photo 2 – Status of OCF August 21, 2001

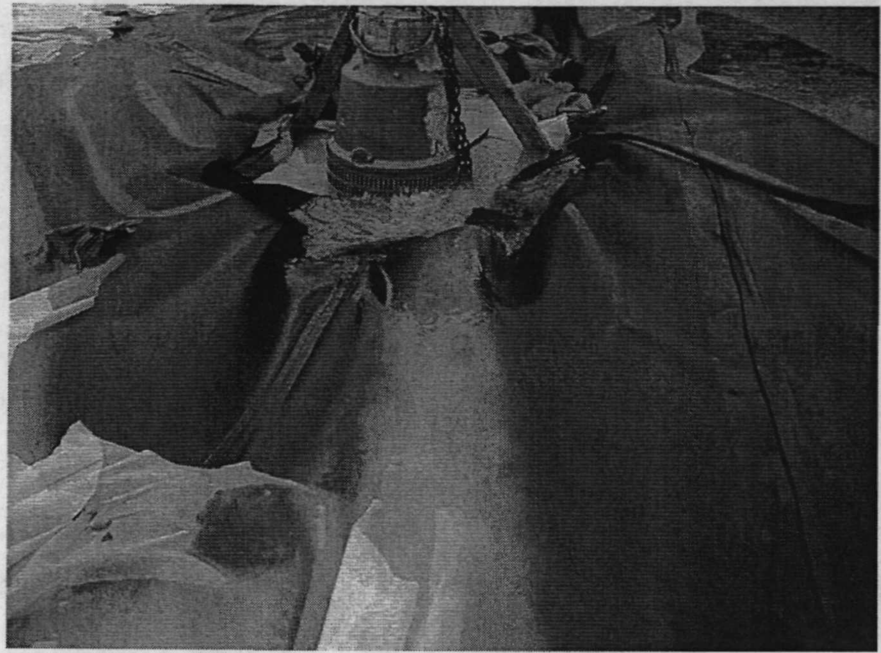

Photo 3 – Flotation of liners and sump pump, August 22, 2001

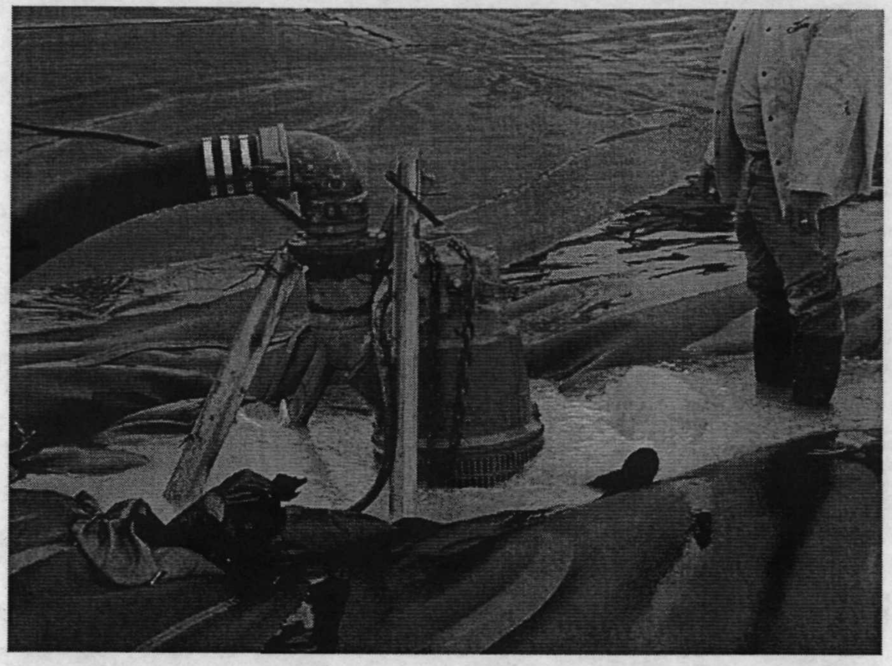

Photo 4 – Relief hole in upper FML, August 22, 2001

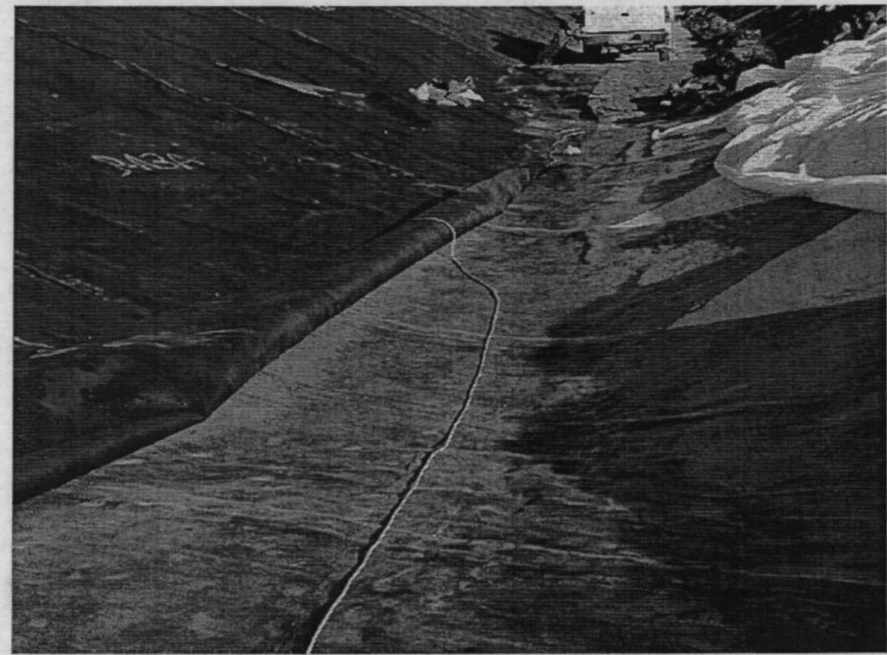

Photo 5 – Hydrated GCL (note footprints), August 25, 2001

Photo 6 – Removal of hydrated GCL, August 25, 2001

Photo 7 – Overall view of OCF cell bottom, August 25, 2001

Photo 8 – Erosion rills in surface of clay, August 25, 2001

Photo 9 – Relief hole in secondary FML, August 25, 2001

Photo 10 – Inspection hole and sump area, August 25, 2001

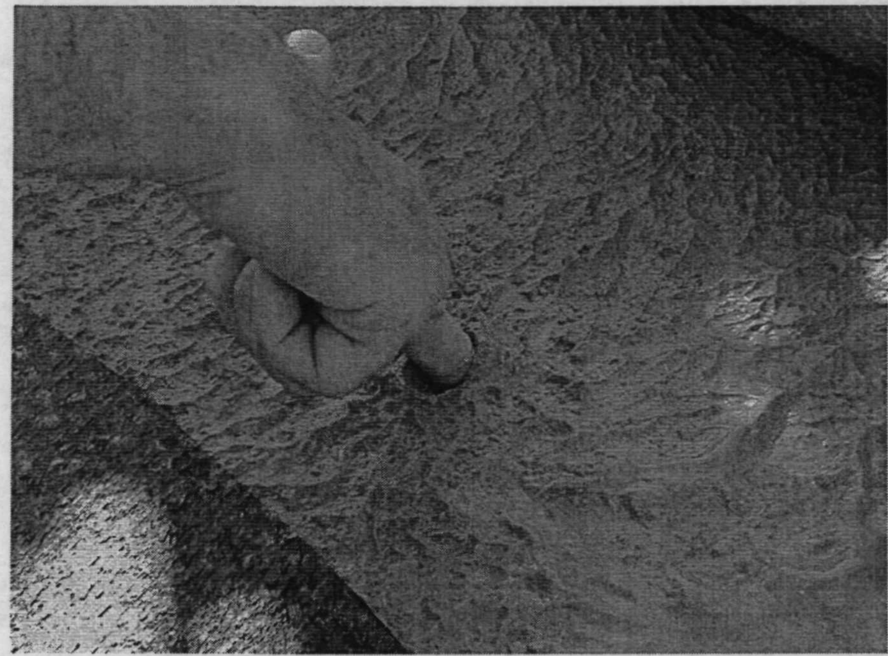

Photo 11 – Indication of maximum depth of hydrated CCL, August 25, 2001

Photo 12 – Removal of hydrated CCL to competent CCL, August 25, 2001

Photo 13 – Inspection of CCL in southeast groin, August 25, 2001

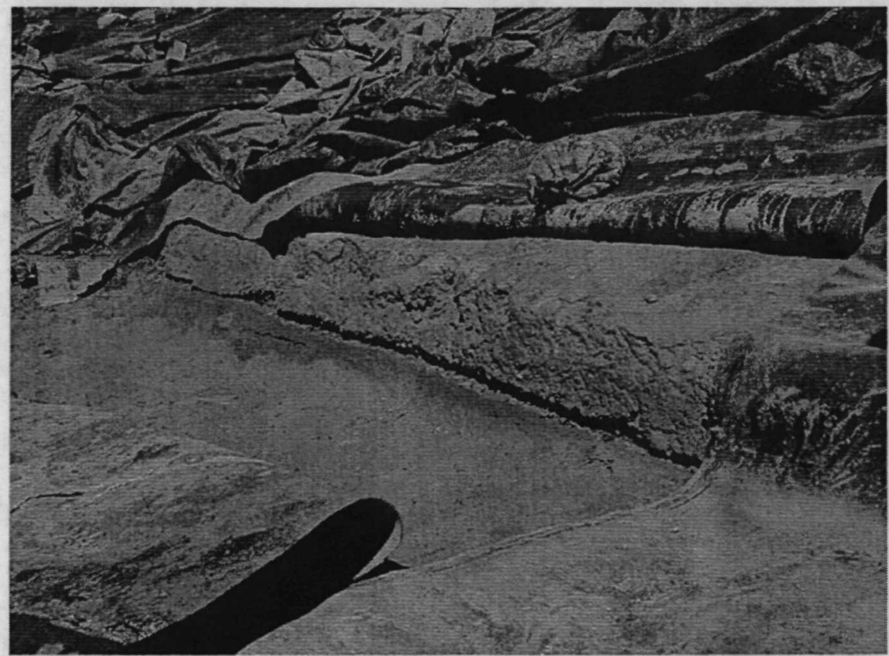

Photo 14 – Erosion rill along interface of subgrade and CCL, August 25, 2001

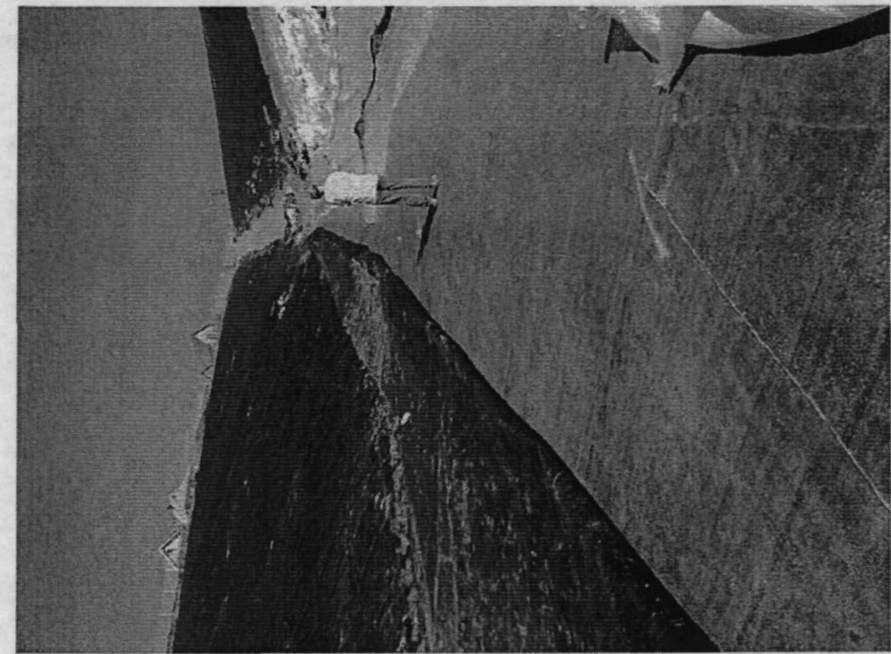

Photo 15 – Pink paint denotes extent of required GCL overlap, August 26, 2001

Photo 16 – Tension cracks in clay near sump, August 25, 2001

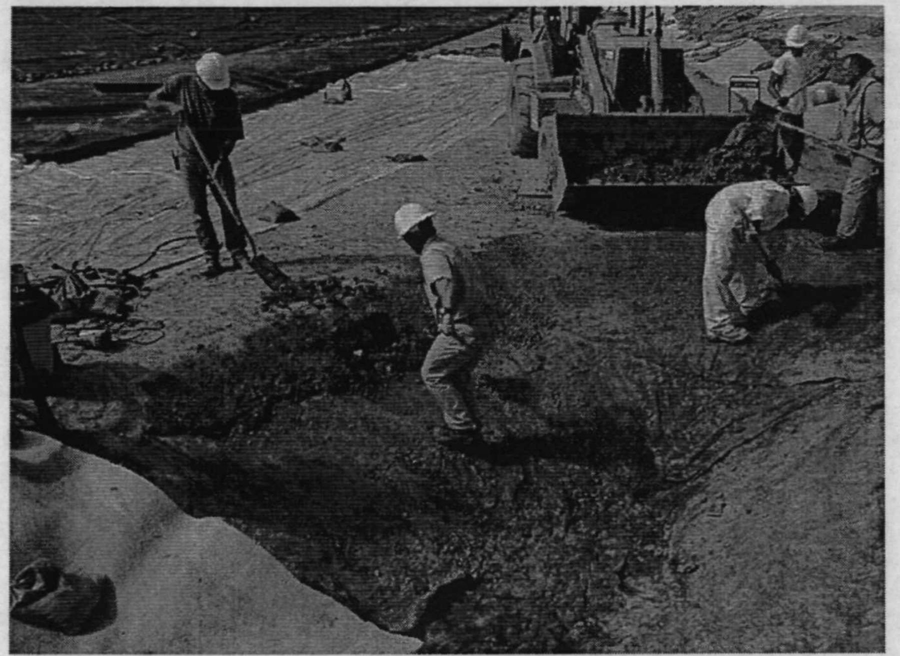

Photo 17 – Removal of damaged clay in sump area, August 27, 2001

Photo 18 – Regrading of drainage rock in LDCRS sump, August 27, 2001

Photo 19 – Replacing and compacting clay in sump, August 19, 2001

Photo 20 – Nearly completed reconstruction of sump, August 28, 2001

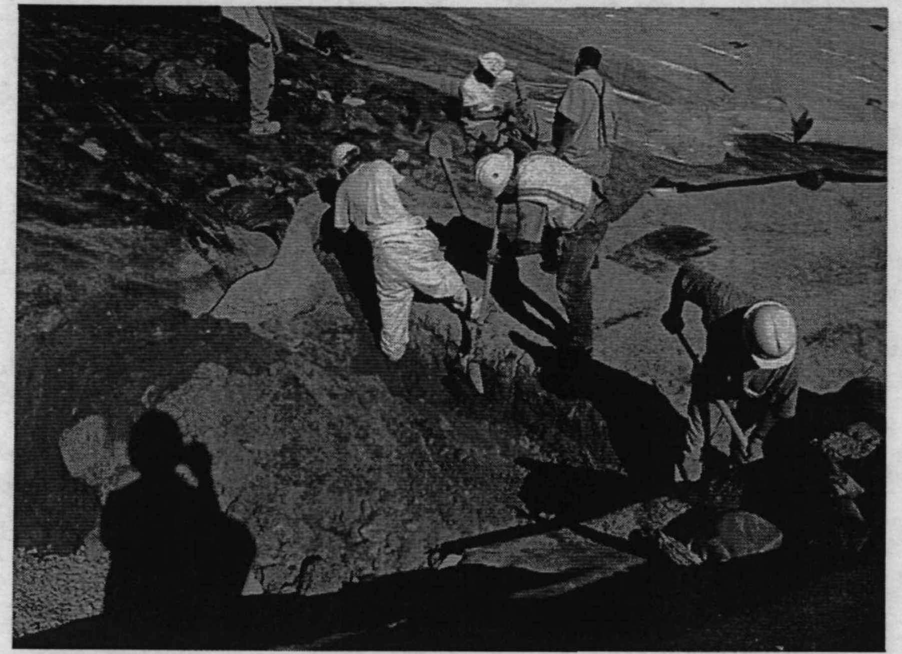

Photo 21 – Excavation of trench for cutoff membrane in north access road, August 28/2001

Photo 22 – East abutment of membrane cutoff trench, August 28, 2001

Photo 23 – West abutment of membrane cutoff trench, August 28, 2001

Photo 24 – Backfilling of membrane cutoff trench (Note flap was folded down gradient and seamed to adjoining liner), August 29, 2001

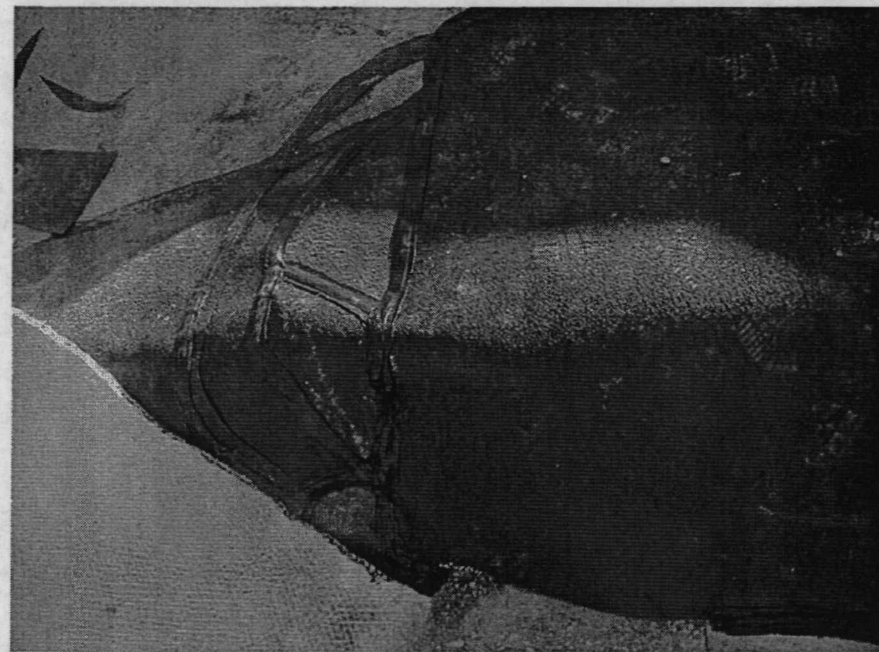

Photo 25 – Example of abutment seaming, east abutment membrane cutoff, August 30, 2001

APPENDIX E

Sump Pump/Controls Documentation

EPG Companies Inc.

Operations & Maintenance Manual

FOR

Envirocon, Inc.
Asarco OCF

EPG Job #01-5416

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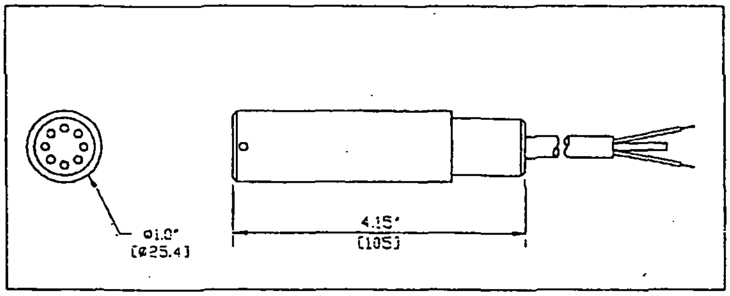
EPG LEVELMASTER™ SUBMERSIBLE LEVEL SENSOR SYSTEM



GENERAL FEATURES

* **Ease of Installation**
  LevelMaster is designed specifically to work with the EPG SurePump™, but it's durability, accuracy and weight make it the logical choice for stand alone applications. The chemical resistant lead wire contains a vent tube for atmospheric pressure compensation.

* **Ranges Available**
  0 to 5 through 0-50 PSIG models are available.
  Please call for special needs.

TRANSMITTER FEATURES:

* **Accuracy**
  LevelMaster has built-in temperature compensation as well as precise calibration giving an accuracy of ±1.0%. at ambient temperature and a combined repeatability and hysteresis error of ±.125%.

* **Fully Submersible**
  LevelMaster transmitter is fully submersible in any liquid compatible with 316 stainless steel and the chemical resistant polyurethane cable jacket. LevelMaster sensor is designed for submergence at depths greater than operating level without sustaining damage. For more severe service consult the factory.

* **Superior Noise Immunity**
  Designed for heavy duty use in hostile environments, LevelMaster gives outstanding noise immunity. Unlike transducers, whose signals may be distorted by outside interference, the LevelMaster utilizes a conditioned compensated 4-20mA output to maximize signal strength and accuracy. The sensor also features a shielded lead to help prevent signal disruption from outside sources.

SPECIFICATIONS

PERFORMANCE

Pressure Range . . . . . 0-5 through 0-50 PSIG
Static Accuracy* . . . . ±1.0% BFSL FSL maximum
Thermal Error** . . . . 0.05% FSO/°C worst case
Proof Pressure . . . . . . 1.5 X rated pressure
Burst Pressure . . . . . . 2.0 X rated pressure
Resolution. . . . . Infinitesimal

* Static accuracy includes the combined errors due to nonlinearity, hysteresis and non-repeatability on a Best Fit Straight Line basis, at 25°C per ISA S51.1.

** Thermal error is the maximum allowable deviation from the Best Fit Straight Line due to a change in temperature, per ISA S51.1.

ENVIRONMENTAL

Compensated temp range . . . . 0° to 50°C
Operating temp range . . . . -20° to 70°C

ELECTRICAL TERMINATION		
2-24 AWG CONDUCTORS IN A SHIELDED CABLE WITH SENSOR BREATHER AND POLYURETHANE JACKET.		
4-20 mA:	RED	+ EXCITATION
	BLACK	- EXCITATION

ELECTRICAL

Excitation . . . . 10 to 40 VDC
Input Current . . . . 20 mA maximum
Output . . . . 4-20 mA (2 wire)

Zero offset, max . . . . 4-20 mA: ±.12mA

Output impedance . . . . <10 ohms
Insulation resistance . . . . . 100 megohms at 50VDC
Circuit protection . . . . Polarity, surge & shorted output
Power supply rejection . . . <±.05% FSO/VDC (mA output)

PHYSICAL

Weight . . . . 7 oz. (not incl. cable)
Cable . . . . Polyurethane jacketed shielded cable with polyethylene vent tube and Kevlar tension members

Wetted materials . . . . 316 SS, Viton
Mounting provision . . . . Suspended by cable

EPG Companies Inc.

USER'S GUIDE

Submersible Level Sensor for Liquid Level Measurement

Congratulations on your purchase of an EPG Companies pressure transmitter. Our precision measurement devices are built to exacting standards. Before shipping, all units pass rigorous inspection by our Quality Assurance program.

Please take a few moments to read this brief user's manual to fully acquaint yourself with the characteristics, features, and benefits of your EPG transmitter.

Future orders may be placed by calling our Applications Support and Order Hotline at 800-443-7426. Call (800) 762-8418 for warranty repair service.

Characteristics of EPG Companies Transducers/Transmitters

All EPG transducers incorporate our isolated diaphragm sensors, which are specifically designed for use with hostile fluids and gases. These sensors utilize a silicon pressure cell that has been fitted into a stainless steel package with a stainless steel barrier diaphragm. This sensor assembly is housed in a rugged 316 SS case, which provides for a variety of pressure inputs

Our devices feature high performance internal signal conditioning. Standard output is 4 to 20 mA. All units have surge and reverse polarity protection.

For your convenience and ease of use in the field, all EPG transmitters are permanently etched with our logo & name, wiring information, part number (P/N), serial number (S/N), date of manufacture (DOM), range, excitation, and output.

All EPG transmitters are designed for rugged use. However, care should be taken to protect these devices from overpressure and sharp impact. When lowering submersible pressure transmitters into a liquid, penetrate the surface slowly and only to the depth necessary. Avoid dropping the unit from above the surface. All transmitters can be cleaned by rinsing them in mild detergent. Do not pressure wash.

Warranty

EPG Companies warrants its products against defects in material and workmanship for 12 months from date of shipment. Products not subjected to misuse will be repaired or replaced. THE FOREGOING IS IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES. EPG Companies reserves the right to make changes to any product herein and assumes no liability arising out of the applications or use of any product or circuit described.

DD100-4 Vent Filter & Water Vapor Trap

The DD100-4 is a replaceable vent tube dehumidifier intended for use with our submersible pressure transmitters. This device is specifically designed to protect sensitive electronic components from mildew, corrosion, rust, and other forms of deterioration while at the same time preventing the formation of a liquid column.

Vent filters should be changed when they are 85% spent. Do not remove the old filter until a new one is available. The number one failure mode is moisture and corrosion damage due to lack of maintenance of the vent filter.

The DD100-4 connects to the existing vent tube as it exits the cable at the junction box via a tube. The unbreakable acrylic drying tube is 4 inches in length and 3/4 inches in diameter. Inserted in each pull-off molded polypropylene drying tube end cap is a 20 micron polypropylene filter.

The drying tube is filled with an indicating desiccant (drying agent). The maximum flow rate through the drying tube is 300 cubic centimeters per minute, more than sufficient to allow the transmitter to respond to barometric changes. As air passes through the drying tube, moisture is absorbed by the desiccant. The desiccant changes from blue to a rose red as its drying capacity becomes diminished.

The desiccant can be rejuvenated after normal use by spreading it in a layer one granule deep and heating for one hour at 205°C (400°F). The heating temperature is very important for if it is lower than 205°C (400°F) the desiccant will not rejuvenate. Alternatively, if the desiccant is overheated, the crystal structure may be altered and render the desiccant permanently inactive. Alternatively, spare vent filters can be ordered by calling 800-443-7426. The DD100-4 vent filter and water vapor trap can be exposed to air, industrial gases, refrigerants, organic liquids, and solvents. It should not, however, be used when ammonia is present.

Polyurethane & Tefzel Jacketed Cable

Most installations of our submersible pressure transmitters connect our cable to a junction box.

From this junction box, end-users run their own cable to the required instrumentation. Specifications for our polyurethane or tefzel jacketed cable are as follows:

Weight	0.04 lbs/ft
Min. OD.	0.28"
Max. OD	0.31"
Conductors	3
Insulation	PVC
Shield	36 gauge spiral tinned copper
Wire	22 AWG (19/34) tinned copper stranding

Chemical Resistance of Polyurethane

Potable Water, Waste Water, Borax, Butane, Animal Fat, Carbonic Acid, Citric Acid, Cod Liver Oil, Corn Oil, Glycerin, Glycol, Mineral Oils, Potassium Nitrate, Potassium Sulfate, Silicone Oils, Stoddard Solvent, Tannic Acid (10), Tartaric Acid, Turbine Oil

Chemical Resistance of Tefzel

Acetic Acid (Glacial), Acetic Anhydride, Acetone, Aluminum Chloride, Anti-Freeze, Bromine, Calcium Chloride, Calcium Hydroxide, Chlorine, Copper Chloride, Ferrous Chloride, Hydrochloric Acid, Ketones, Lacquer Thinners, Sulfuric Acid.

Cable Lengths

The maximum length of cable to be used with our submersible pressure transmitter is up to 10,000 feet.

ORDERING INFORMATION

PHONE: (800)443-7426 Sales Representatives are available from Monday through Friday from 8:00 A.M until 5:00 P.M. Central time.

MAIL: Mail your order to: EPG Companies, Inc.
P.O. Box 427
Rogers, MN 55374

FAX: (763) 493-4812 We accept fax orders 24 hours a day, 7 days a week.

SERVICE INFORMATION

PHONE: (800) 762-8418 Customer Services Personnel are available Monday through Friday 8:00 A.M. to 5:00 P.M. Central time.

EPG LevelMaster™

Setup and Troubleshooting

The EPG LevelMaster system uses a submersible pressure transmitter to detect changes in fluid levels and a programmable meter featuring a digital LED display and front panel keypad to monitor and control fluid levels. The user can program the desired control parameters for a single pump and two other level control functions or a dual pump system with one other level function. The LevelMaster readout is in inches unless otherwise programmed. During a pumping and/or an alarm condition, the display alternates between the message and the current liquid level reading. The message indicates which function is active (see below).

FUNCTION	MESSAGE
Hi	High alarm exceeded. Display flashes current level.
H1	High alarm (1st) exceeded. Display flashes current level.
H2	High alarm (2nd) exceeded. Display flashes current level.
Lo	Low alarm exceeded. Display flashes current level.
L1	Low alarm (1st) exceeded. Display flashes current level.
L2	Low alarm (2nd) exceeded. Display flashes current level.
P	Pump relay activated. Display flashes current level. (Lead pump in two pump system)
P2	Pump relay activated. Display flashes current level. (Lag Pump in two pump system.)
Hi P	High alarm & pump relay activated. Display flashes current level.
P Lo	Pump relay & low alarm relay activated. Display flashes current level.

GENERAL SETUP OPERATIONS

IMPORTANT - During setup, if two (2) minutes elapse without a keypad entry the meter automatically returns to the run mode without the entered changes being stored. DO NOT USE FINGERNAIL OR OTHER SHARP OBJECT TO PROGRAM METER. DAMAGE TO KEYPAD MAY RESULT.

DISPLAY	INSTRUCTION
SETUP	This prompt tells you to enter the lockout code (35) in order to enter the set-point setup mode.
Pr-Hi	This prompt, followed by the default setting, tells you to select the Pump Relay High set-point. This is the pump ON set-point.
Pr-Lo	This prompt, followed by the default setting, tells you to select the Pump Relay Low set-point. This is the pump OFF set-point.
Al-Hi	This prompt, followed by the default setting, tells you to select the Alarm High Relay set-point. This is the high level alarm set-point.
Hy-Hi	This prompt, followed by the default setting, tells you to select the hysteresis for the Alarm High Relay set-point. This value, when subtracted from the high-level-alarm set-point, sets the disengage point for the high-alarm condition.
Al-Lo	This prompt, followed by the default setting, tells you to select the Alarm Low Relay set-point. This is the low level alarm set-point.

Hy-Lo	This prompt, followed by the default setting, tells you to select the hysteresis for the Alarm Low Relay set-point. This value, when added to the low-level-alarm set-point, sets the disengage point for the low level.
Pr-H1	This prompt, followed by the current setting, tells you to select the Lead Pump on set-point. This is the Lead Pump ON set-point.
Pr-H2	This prompt, followed by the default setting, tells you to select the Lag Pump on set-point. This is the Lag Pump ON set-point.

LevelMaster Set Up Procedures for Simplex Operations (SDHL meters only)

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows **Pr-Hi** (pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows **Pr-Lo** (pump OFF set point) followed by current value.
6	Push arrow buttons to set the desired pump OFF level. Push SETUP/ENTER button.
7	Meter shows **Hi-Al** (High Level Alarm) followed by current value.
8	Press arrow buttons to set desired high level alarm point. Push SETUP/ENTER button.
9	Meter shows **HY-Hi**. Press arrow buttons to select value. Push SETUP/ENTER button.
10	Meter shows **Al-Lo** (low level alarm set point) followed by current value.
11	Press arrow buttons to set desired low level alarm point. Push SETUP/ENTER button.
12	Meter shows **HY-Lo**. Press arrow buttons to select value.
13	Push SETUP/ENTER button. Meter shows **RUN**.

EXAMPLE:

If the desired levels for the pump were:	Pump ON	18.0"
	Pump OFF	12.0"
	High Level Alarm	30.0"
	High Level Alarm Hys.	1.0"
	Low Level Alarm	6.0"
	Low Level Alarm Hys.	1.0"

Complete steps 1 - 3 above.
Select **18.0** with arrow buttons for the **Pr-Hi** value. Push SETUP/ENTER.
Pr-Lo is displayed, select **12.0** with the arrow buttons for the Pump OFF value. Push SETUP/ENTER.
Hi-Al is displayed, select **30.0** with the arrow buttons for the High Alarm value. Push SETUP/ENTER.
HY-Hi is displayed, select **1.0** with the arrow buttons for the High Level Alarm OFF value (value determined by subtracting from high-level-alarm set-point). Push SETUP/ENTER.
Al-Lo is displayed, select 6.0 with the arrow buttons for the Low Alarm value. Push SETUP/ENTER.
HY-Lo is displayed, select 1.0 with the arrow buttons for the Low Level Alarm OFF value (value, when added to Alarm point, will reset alarm). Push SETUP/ENTER. Meter shows **RUN**.

LevelMaster Set Up Procedures for Simplex Operations (SDHH meters only)

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows **Pr-Hi** (pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows **Pr-Lo** (pump OFF set point) followed by current value.
6	Push arrow buttons to set the desired pump OFF level. Push SETUP/ENTER button.
7	Meter shows **AL-H1** (High Level Alarm) followed by current value.
8	Press arrow buttons to set desired high level alarm point. Push SETUP/ENTER button.
9	Meter shows **HY-Hi**. Press arrow buttons to select value. Push SETUP/ENTER button.
10	Meter shows **AL-H2** (High-High level alarm set point) followed by current value. Factory default setting is 150.0. **NOTE: Pumps will not run in auto mode if high-high level is exceeded.**
11	Press arrow buttons to set desired high-high level alarm point. Press SETUP/ENTER button.
12	Meter shows **HY-H2**. Press arrow buttons to select value.
13	Push SETUP/ENTER button. Meter shows **RUN**.

EXAMPLE:

If the desired levels for the pump were:

Pump ON	18.0"
Pump OFF	12.0"
High Level Alarm	30.0"
High Level Alarm Hys.	1.0"
High-High Alarm	150.0"
High-High Alarm Hys.	0.0"

Complete steps 1 - 3 above.
Select **18.0** with arrow buttons for the **Pr-Hi** value. Push SETUP/ENTER.
Pr-Lo is displayed, select **12.0** with the arrow buttons for the Pump **OFF** value. Push SETUP/ENTER.
Hi-Al is displayed, select **30.0** with the arrow buttons for the High Alarm value. Push SETUP/ENTER.
HY-Hi is displayed, select **1.0** with the arrow buttons for the High Level Alarm **OFF** value (value determined by subtracting from high-level-alarm set-point). Push SETUP/ENTER.
Al-H2 is displayed. Value should be 150.0", if you wish to change value, use arrow buttons to change. Push SETUP/ENTER.
HY-Lo is displayed Set at 0.0".
Push SETUP/ENTER. Meter shows **RUN**.

Level Master Set Up Procedures for Duplex Operations (DDHX meters only)

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows PR-H1 (Lead Pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows PR-H2 (Lag Pump ON set point) followed by current value.
6	Push arrow buttons to set the desired pump ON level. Push SETUP/ENTER button.
7	Meter shows PR-LO (Common Low Pump OFF set point) followed by current value.
8	Press arrow buttons to set desired level alarm for pumps OFF. Push SETUP/ENTER button.
9	Meter shows Al-Hi (High Level Alarm set point) followed by current value.
10	Push arrow buttons to set desired alarm level. Push SETUP/ENTER button.
11	Meter shows HY-Hi. Set at 1.0". Press arrow buttons to select value.
12	Push SETUP/ENTER button. Meter shows RUN.

EXAMPLE:

If the desired levels for the pump were:

Lead Pump ON	18.0"
Lag Pump ON	24.0"
Pumps OFF	12.0"
High Level Alarm	30.0"
High Level Alarm Hysteresis	1.0"

Complete steps 1 - 3 above.
Select **18.0** with arrow buttons for the **PR-H1** value. Push SETUP/ENTER.
PR-H2 is displayed, select **24.0** with the arrow buttons. Push SETUP/ENTER.
PR-LO is displayed, select **12.0** with the arrow buttons. Push SETUP/ENTER.
Al-Hi is displayed, select **30.0** with the arrow buttons. Push SETUP/ENTER.
HY-Hi is displayed, select **1.0** with arrow buttons.
Push SETUP/ENTER. Meter shows **RUN**.

INSTALLATION NOTES AND TROUBLESHOOTING

BACKGROUND: Numerous installations of the EPG LevelMaster system have proven its long-term reliability. The majority of malfunctions of the LevelMaster system are the result of improper installation and handling of the pressure transmitter sensor. During new installations, be certain to check for any shipping damage, loose controller connections or parts that may have come loose during shipment.

A. IMPROPERLY INSTALLED SENSOR VENT DRYER. The sensor vent tube, a small hollow tube in the center of the leadwire, must be connected to the dryer cylinder in the controller to prevent moisture from entering and damaging the sensor. The vent tube must be open to the dryer to allow atmospheric pressure equalization.

B. DAMAGED/CUT/CRUSHED SENSOR LEADWIRES. Most failures at startup or shortly thereafter are the result of damaged sensor leadwires. If the leadwire outer shield is damaged, moisture can enter the conductors causing intermittent or complete failure.

> USE CARE WHEN INSTALLING THE LEADWIRE during pump installation. Protect the leadwire with sleeving or plastic tubing to prevent cutting or gouging the insulation when feeding the leadwire through or over any sharp or jagged edges.

C. IMPROPER SENSOR LEADWIRE CONNECTION. Check the schematic drawing shipped with the pump controller to assure the sensor BLUE (BLACK on some models) wire is connected to the minus (-) controller terminal and the sensor WHITE (RED on some models) wire is connected to the plus (+) controller terminal.

D. PHYSICAL ABUSE/DAMAGE OF THE SENSOR. Do not attempt to disassemble the sensor. Do not strike or hammer against a hard surface. - *THE WARRANTY IS VOID IF THE PROBE HAS BEEN DISASSEMBLED, DENTED OR CRUSHED.*

SYMPTOM/DISPLAY	PROBABLE CAUSE	REPAIR
Continuous above full scale reading (above 139).	Loose connections in circuit. Short circuit in sensor leadwire or connector or circuit. Faulty sensor.	Repair connections in controller. Replace sensor. Replace sensor.
-34.6 reading.	Leadwire damaged or reversed connections. Open circuit in sensor leadwire or controller connections. Faulty power supply in meter.	Check schematic, repair connections. Replace sensor and leadwire. Check IS barrier. Replace meter.
Erratic readings.	Damaged sensor leadwire. Improper connections. Faulty meter.	Check schematic, repair connections. Replace sensor and leadwire. Replace meter.

S3070-PT TRANSDUCER SIMULATOR
Operation

The model 3070-PT Transducer Simulator is a device designed for the express purpose of testing an EPG LevelMaster™ level controller circuit while temporarily bypassing the existing level sensor. In the "Run" (normal operation) mode liquid level in the sump applies pressure on the level sensor. The sensor converts that force into an electrical signal. The electrical signal is transmitted by the sensor cable to the level meter where it is converted into a liquid level display.

The "Test" mode simulates a level sensor signal. Rotating the potentiometer changes the electrical signal forcing the system to function as if a level sensor were in the circuit. Varying the electrical signal changes the level meter display in the same manner in which the level sensor signal would effect the system. By turning the simulator knob slowly clockwise from top to bottom the meter will display each set point such as start, stop and alarms. With the toggle switch turned back to the "Run" position the potentiometer is removed from the circuit and the level sensor controls according to the set points. Meter values register actual liquid level.

"**CAUTION**", care must be taken when using this device in "Test" mode to avoid damaging the motor by running it dry. In normal test mode the pump switches should be off.

S3070-PT TRANSDUCER SIMULATOR TEST PROCEDURE

1. When the toggle switch is in the "Run" position the controls should function normally.
2. When the toggle switch is in the "Test" position (pressure transducer temporarily removed from he control circuit) the level meter should display the liquid level. By turning the simulator knob slowly clockwise from top to bottom the meter will display each set point such as start, stop, and alarms. Care must be taken when using this device in the "Test" mode to avoid damaging the motor by running it dry. In normal test mode the pump switches should be off.
3. Make sure that the potentiometer has full travel (270 degrees maximum) in both clockwise and counter-clockwise directions.
4. Make sure that all of the wires on the rear of the simulator (wires 200, 201, 202, 203) are connected in the proper position.
5. Replace the transducer simulator if it does not function as described above.

TYPE "SR" PVC SUCTION AND TRANSFER HOSE

APPLICATIONS: Trash pump hose, irrigation pumping, slurry handling, and leachate transfer in landfills.

FEATURES: Heavy duty PVC suction and transfer hose. Superior vacuum rating. Smooth bore eliminates material build-up. Rigid polyvinyl chloride, in general, shows excellent resistance to acids, alkalis, aqueous solutions of salts, and many organic solvents and oils. Plasticized PVC is attacked by certain chlorinated hydrocarbons, aromatics, esters, ketones, aldehydes, phenols, and strong oxidizing agents.

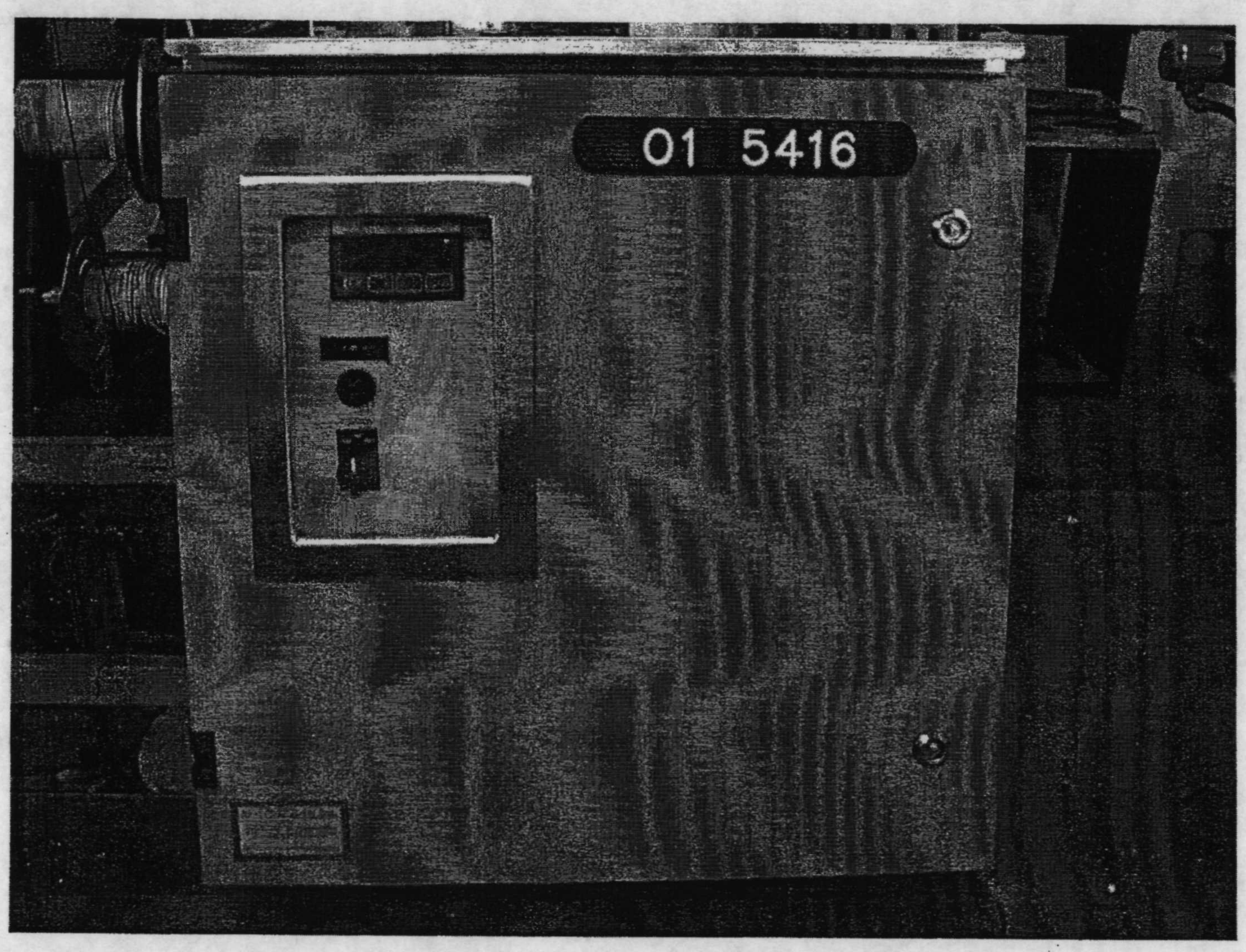
This chemical resistance is based on tests of specimens conducted by completely submerging the hose sample in the listed chemical or reagent. In critical applications, it is suggested that greater reliance be placed on actual field experience or that testing be performed under conditions of stress, exposure, temperature and duration which can be related to the anticipated application.

DESCRIPTION: Clear flexible with orange helix.

SERVICE TEMPERATURE: -13° F to 158° F

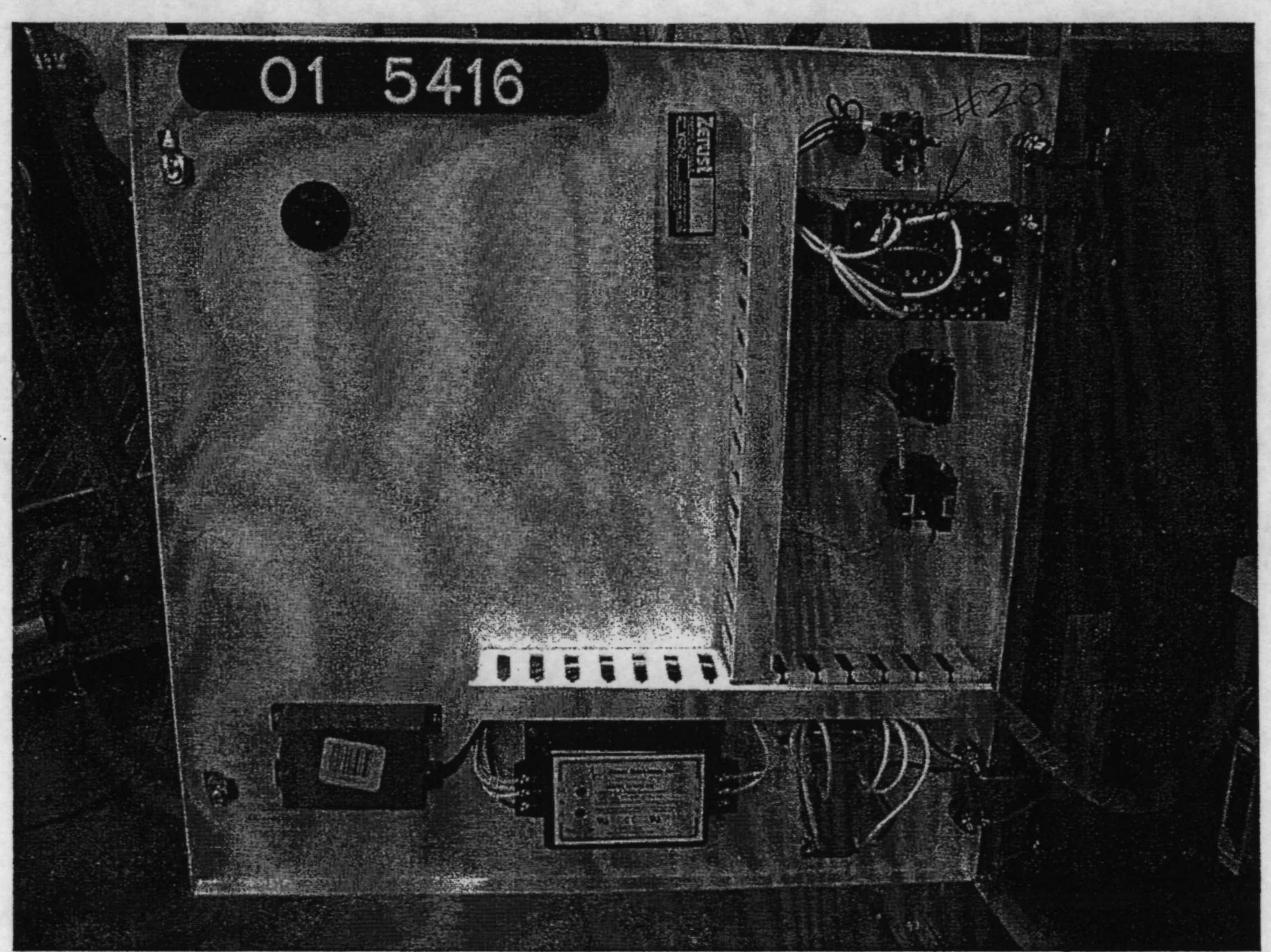
TYPE SR SPECIFICATIONS

Series	ID Inch	OD Inch	Working Pressure PSI	Vacuum Rating In/HG	Min. Bend Radius Inches	Bursting Pressure PSI	Approx. Wt. Lbs./100 Ft.
SR 150	1½"	2.01	125	Full	2	375	41
SR 200	2"	2.56	125	Full	3.5	375	65
SR 300	3"	3.60	125	Full	3.5	375	107
SR 400	4"	4.72	100	Full	7.1	300	174
SR 600	6"	7.17	50	Full	10.2	150	387

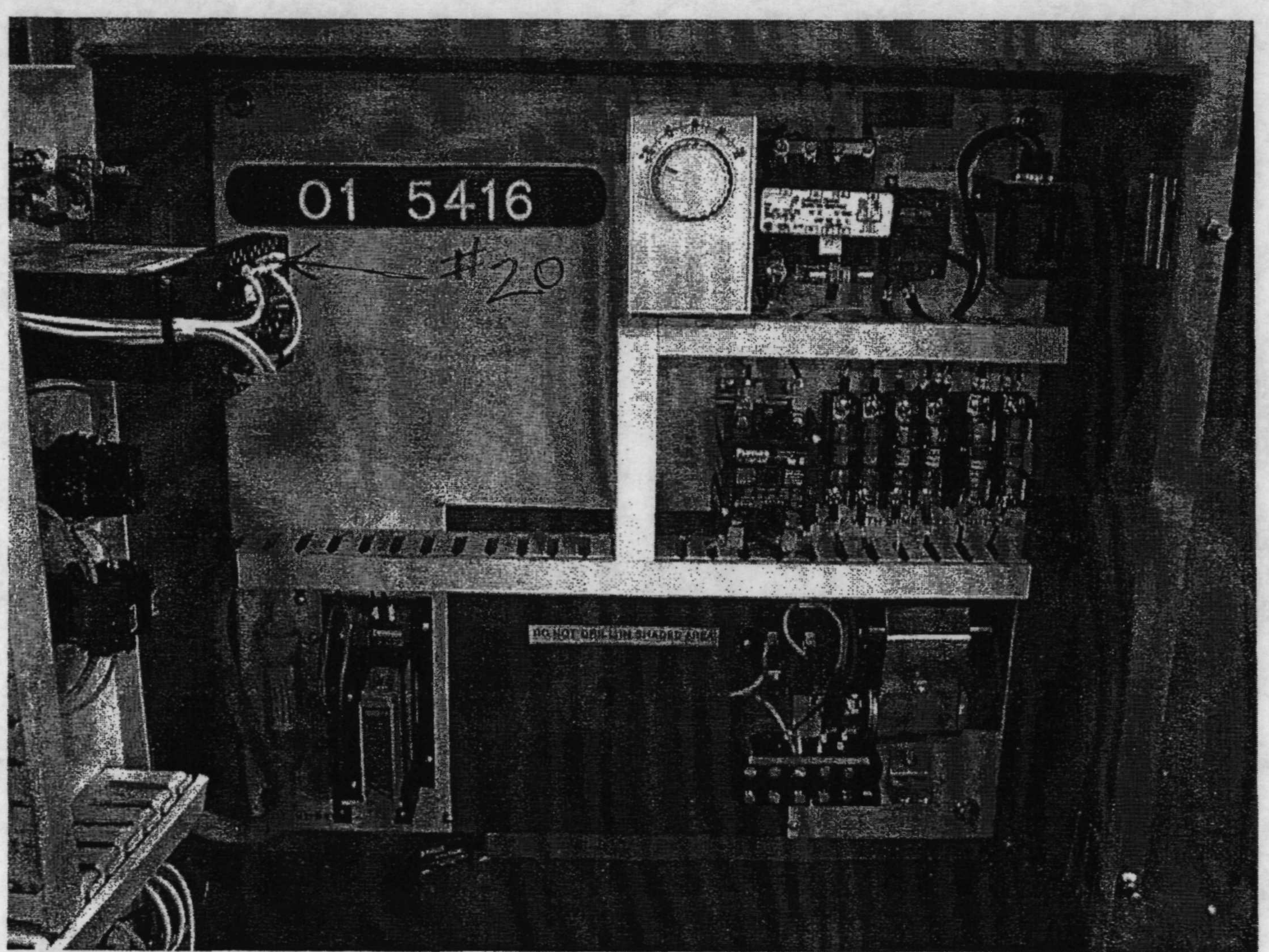


A

B



C



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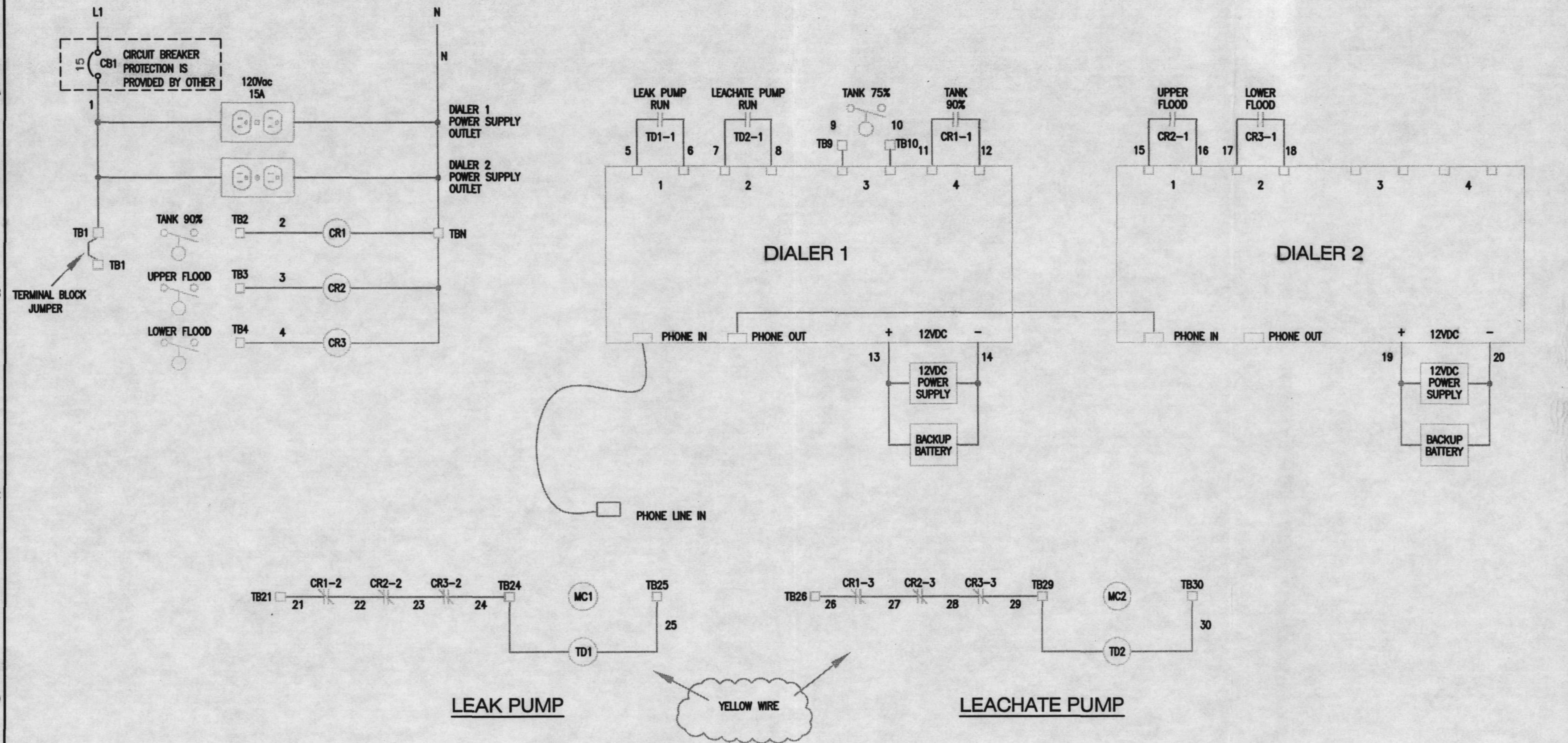
(b) (4)

[redacted]

Joe Hassken – Minneapolis

REV	DATE	DESCRIPTION



CUSTOM & CONTROLS

4630 16TH STREET EAST, SUITE B24
FIFE, WASHINGTON, 98424
PHONE (253) 922-5874

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES.

.X	±	.1
.XX	±	.03
.XXX	±	.010
X/X	±	1/4
X°	±	2°

UPPER VAULT
LEACHATE PUMP CONTROLS

ELECTRICAL
DIAGRAMS

SHT 1 OF 1 PROJECT 05-383

DRAWN: D. LEWIS	11/10/05
CHECKED:	
APPROVED:	
CCC DRAWING NUMBER:	
DRAWING NUMBER 050203EI001	REV A

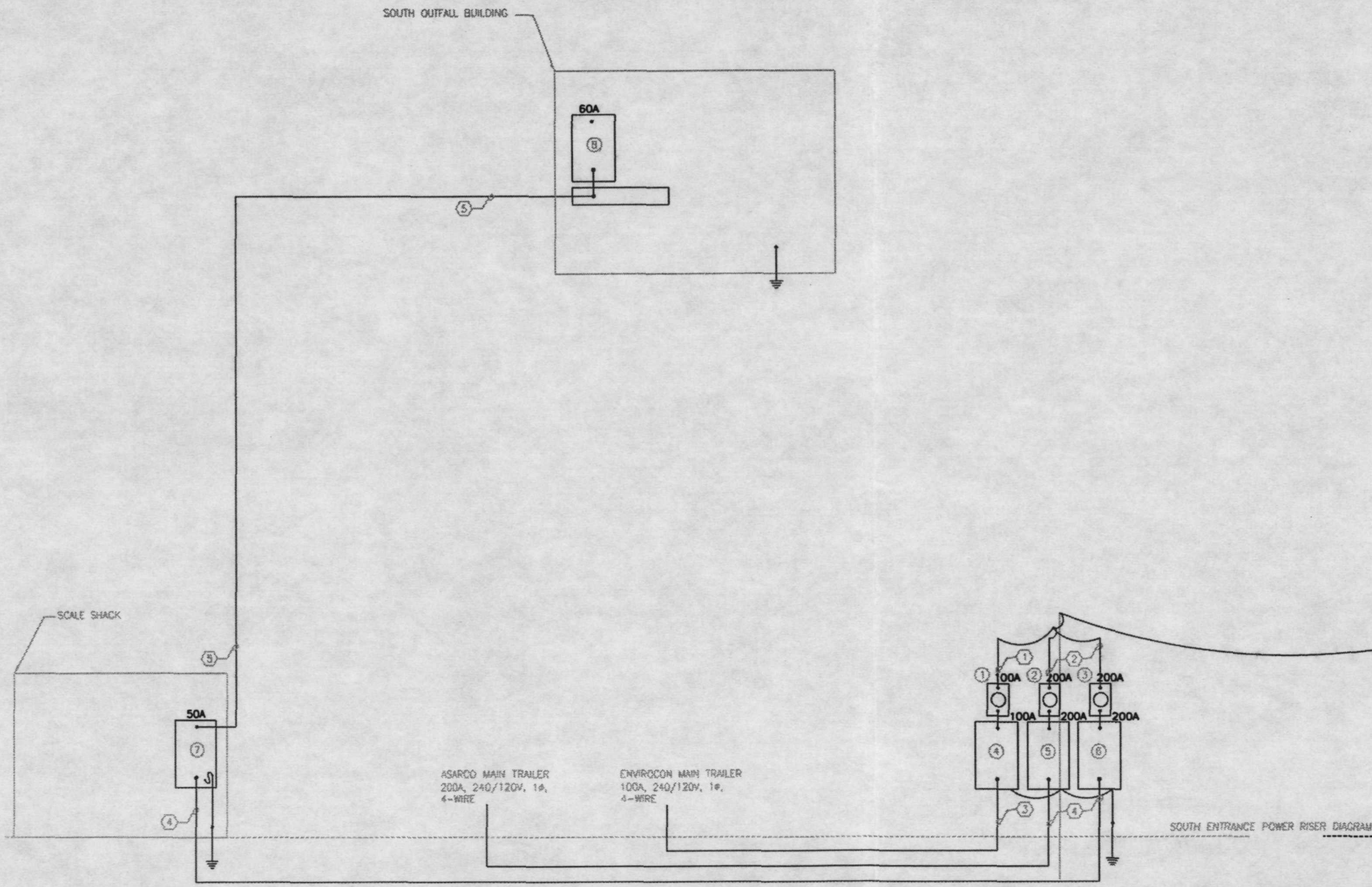
REV	DATE	DESCRIPTION

FEEDER SCHEDULE			
NO.	CONDUIT SIZE	CONDUIT TYPE PVC OR EMT	WIRE SIZE
1	2" CONDUIT	PVC	(3) #4 THHN STRANDED CU RISER IS SCH80
2	2" CONDUIT	PVC	(3) #3/0 THHN STRND. CU, RISER IS SCH80
3	2" CONDUIT	PVC	(3) #4 THHN STRND. CU, W/#6 THHN STRND. CU GND.
4	2" CONDUIT	PVC	(3) #3/0 THHN STRND. CU, W/#6 THHN STRND. CU GND.
5	2" CONDUIT	PVC	(3) 4/0 XHHW AL, WITH (1) #2/0 XHHW AL
6			
7			
8			
9			
10			
11			
12			
13			

	EQUIPMENT SCHDEDULE (**INDICATES EXISTING EQUIPMENT)
1	SqD MODEL U121314, 100A, 1ø, METER BASE
2	SqD MODEL U284, 200A, 1ø, METER BASE
3	SqD MODEL U284, 200A, 1ø, MTER BASE
4	SqD MODEL D323NRB, 100A, 240V, 3POLE, NEMA 3R FUSABLE DISCONNECT, W/100A FUSES(FRN-R100)
5	SqD MODEL D324NRB, 200A, 240V, 3POLE, NEMA 3R FUSABLE DISCONNECT, W/200A FUSES(FRN-R200)
6	SqD MODEL D324NRB, 200A, 240V, 3POLE, NEMA 3R FUSABLE DISCONNECT, W/200A FUSES(FRN-R200)
7	CUTTLER-HAMMER MODEL CH32B200J, 225A, 240V, 1ø, PANEL W/MAIN CB, 200A@25KAIC
8	CUTTLER-HAMMER, 100A, 240/120V, 1ø, 8-SLOT PANEL, W/40A 2POLE MAIN
9	

CONSTRUCTION NOTES

1. DRAWING FOR INTERCONNECTION PURPOSES ONLY NOT TO SCALE OR PROPER OREINTATION
2. GROUNDED PER NEC AND LOCAL CODES



SOUTH POWER RISER DIAGRAM

DIAGRAMMATIC

CUSTOM ELECTRIC & CONTROLS
4630 16TH STREET EAST, SUITE B24
FIFE, WASHINGTON, 98424
PHONE (253) 922-5874

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES.

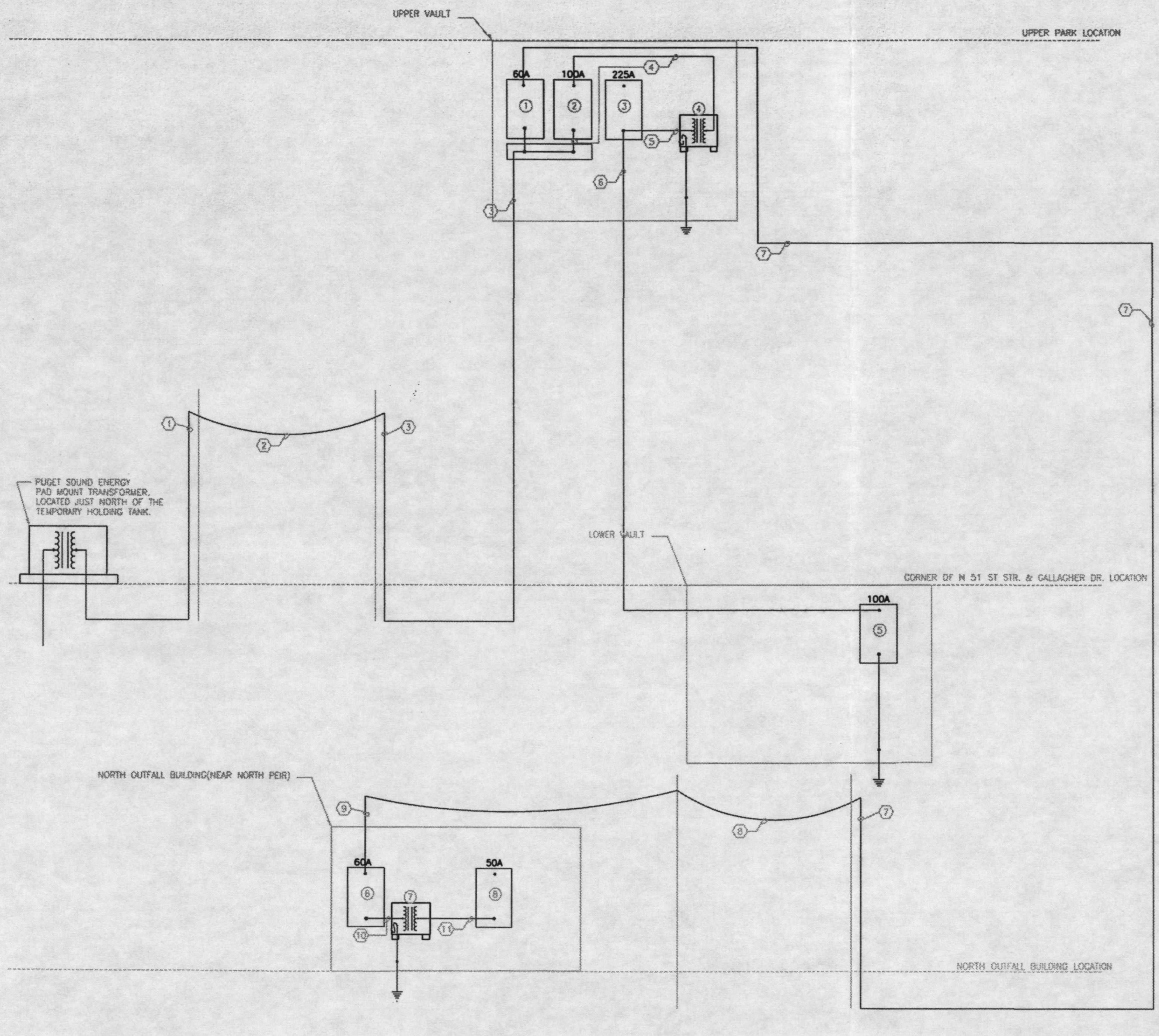
.X	±	.1
.XX	±	.03
.XXX	±	.010
X/X	±	1/4
X°	±	2°

ASARCO
SOUTH
POWER DIAGRAM

SHT 1 OF 1 PROJECT S-PRD-

DRAWN:	
CHECKED:	
APPROVED:	
CCC DRAWING NUMBER: 05-XXX	
DRAWING NUMBER	REV

REV	DATE	DESCRIPTION



NORTH END POWER RISER DIAGRAM

DIAGRAMMATIC

FEEDER SCHEDULE			
NO.	CONDUIT SIZE	CONDUIT TYPE PVC OR EMT	WIRE SIZE
1	(2) RUNS OF 4" CONDUIT	PVC	1-(4) #250MCM, XHHW, AL ONE SPARE(RISER IS SCH80)
2	(1) SPAN OF O.H. TRI-PLEX	ARIEL	(3) #2/0XHHW AL, (1) #2/0 W/STEEL MESSANGER WIRE
3	(2) RUNS OF 2" CONDUIT	PVC	1-(4) #2/0 XHHW AL 1-TELEPHONE RISER
4	1" CONDUIT	PVC	(3) #4THHN, W/#8THHN GND
5	2" LIQUID TIGHT	LFMC	(4) 4/0 XHHW AL, W/#6THHN GND
6	1" CONDUIT	PVC	(3) #10 THHN CU, W/#10 THHN CU GND
7	2" CONDUIT	PVC	(3) #4/0 AND (1) #2/0
8	(1) SPAN OF O.H. TRI-PLEX	ARIEL	(3) #2/0XHHW AL, (1) #2/0 W/STEEL MESSANGER WIRE
9	1" CONDUIT	PVC	(4) #10 THHN CU
10	1" CONDUIT	PVC	(4) #10 THHN CU
11	1" CONDUIT	PVC	(4)#8 THHN CU GROUND PER NEC 250
12			
13			

	EQUIPMENT SCHDEDULE (**INDICATES EXISTING EQUIPMENT)
1	SqD MODEL H363RB, 100A, 600V, 3POLE, NEMA 3R, FUSABLE DISCONNECT W/70A RK5 FUSES(FSR-R70)
2	SqD MODEL 45T3H, 45KvA, 3ø, DRY TYPE TRANSFORMER, 480V PRIM to 208/120V SEC
3	SqD MODEL H362RB, 60A, 600V, 3POLE, NEMA 3R, FUSABLE DISCONNECT W 40A RK5 FUSES(FSR-R50)
4	**SqD, 225A, 240/120V, 3ø, 4-WIRE, NEMA 3R LOAD CENTER W/200A MAIN CB & 42-SPACES
5	SqD MODEL Q06-12L100RB, 100A, 240/120V, 1ø LOAD CENTER W/20A 2P MAIN CB(CIR#1&2)
6	SqD MODEL DH361UK, 30A, 600V, 3POLE, NEMA 3R, NON-FUSABLE DISCONNECT
7	SqD MODEL 10S1F, 10KvA, 1ø, DRY TYPE TRANSFORMER, 480x240V PRIM to 240/120V SEC
8	**WESTINGHOUSE TYPE WBA, 50A, 240/120V, 1ø, 3-WIRE, PANEL W/30 2P MAIN CB(CIR#15&17)
9	

CONSTRUCTION NOTES

1. DRAWING FOR INTERCONNECTION PURPOSES ONLY NOT TO SCALE OR PROPER OREINTATION
2. GROUNDED PER NEC AND LOCAL CODES

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FIFE, WASHINGTON, 98424
PHONE (253) 922-5874

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES.

.X	±	.1
.XX	±	.03
.XXX	±	.010
X/X	±	1/4
X°	±	2°

ASARCO
NORTH END
POWER RISER
DIAGRAM

SHT 1 OF 1 PROJECT 05-XXX

DRAWN:	
CHECKED:	
APPROVED:	
CCC DRAWING NUMBER:	
DRAWING NUMBER NE-PRD-1	REV

APPENDIX F

Geosynthetic Product Information

SERROT INTERNATIONAL, INC.

Memo

To: Mark Wells

From: Teri Jones

cc:

Date: 03.16.01

Re: ASARCO

Serrot International, Inc. hereby certifies that the rolls of 40 mil textured HDPE to be delivered for the ASARCO Smelter OCF project meet or exceed the following specification parameters:

Low Temperature Brittleness (ASTM D746)	-75 degrees F
Resistance to Soil Burial (ASTM D3083)	+/- 10%
Environmental Stress Crack (ASTM D1693)	1500

NSC

National Seal Company

Columbia Geosystems Ltd., a subsidiary

Quality Assurance

Welding Rod

Resin Type : HDPE

Solvay Resin Batch : C990605P03

Columbia Geosystems Resin Batch # 547

Density	ASTM D1505	0.943 g/cc
Carbon Content	ASTM D4218	2.31 %
O.I.T.	200° C. Al pan	135 minutes

Columbia Geosystems certifies that the welding rod is made from the above mentioned HG geomembrane resin and is of the same type and quality as the sheet supplied for the project.

Columbia Geosystems Limited

Bruce Wallace
Quality Control Supervisor

Specifications

Series HTX01 - English

High Density Polyethylene (HDPE) – DS Textured

Serrot's HDPE geomembranes are produced from first quality, high molecular weight resins and are manufactured specifically for containment of fluids in hydraulic structures. Serrot geomembranes are durable and have been formulated to be resistant to chemicals, ultraviolet degradation and leaching additives. The series of geomembranes shown below is based on a minimum average thickness value equal to the nominal thickness, with the lowest individual of 10 values equal to nominal minus 10%.

Property	Test Method	Frequency[1]	HT401	HT601	HT801	HT1001
Thickness (nominal) (mils)			40	60	80	100
Thickness (min. ave.) (mils)	D5199	per roll	40	60	80	100
• Lowest individual of 10 values			36	54	72	90
Tensile Properties (min. ave.)	D638 Type IV	50,000 SF				
• Yield Strength (lb/in)	(2 ipm)		84	126	168	210
• Break Strength (lb/in)			60	90	120	150
• Yield Elongation (%)	(1.3" gauge)		10	12	12	12
• Break Elongation (%)	(2.0" gauge)		100	100	100	100
Tear Resistance (min. ave.) (lb)	D1004	50,000 SF	28	42	56	70
Puncture Resistance (min. ave.) (lb)	D4833	50,000 SF	60	90	120	150
	FTMS 101/ Method 2065[2]	Certified	52	78	104	130
Carbon Black Content (range) (%)	D1603/D4218	50,000 SF	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	D5596	50,000 SF	Note	Note	Note	Note
Density (min. ave.) (g/cc)	D1505/D792	Resin Batch	0.940	0.940	0.940	0.940
Stress Crack Resistance (hr)	D5397 (App.)	Resin Batch	200	200	200	200
Dimensional Stability (max. ave.) (%)	D1204	Resin Batch	±2	±2	±2	±2

[1]Testing frequencies are rounded to the nearest full roll.
[2]FTMS 101 has been replaced with D4833. Value shown for comparison purposes only.
Carbon Black Dispersion for 10 different views: all 10 in Categories 1 or 2.

SERROT INTERNATIONAL, INC.
Corporate Headquarters: 125 Cassia Way • Henderson, NV 89014 • 702-566-6600 • Fax: 702-566-4739
Toll Free: 800-237-1777 www.serrot.com

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

Date : 14/03/01 **Shipping / Packing List** Page : 1

CUSTOMER: 125-01-08 Bill of Lading: 125-08

DESTINATION: RUSTON, WA

	Roll Number	Weight (LBS)	Square Feet	Dimensions (FT)	QC
1	DS 040 L00 22906B	3,644	17,940.00	23.00 x 780.00	
2	DS 040 L00 22907B	3,640	17,940.00	23.00 x 780.00	
3	DS 040 L00 22908B	3,636	17,940.00	23.00 x 780.00	
4	DS 040 L00 22909B	3,625	17,940.00	23.00 x 780.00	
5	DS 040 L00 22910B	3,629	17,940.00	23.00 x 780.00	
6	DS 040 L00 22911B	3,630	17,940.00	23.00 x 780.00	
7	DS 040 L00 22912B	3,627	17,940.00	23.00 x 780.00	
8	DS 040 L00 22913B	3,629	17,940.00	23.00 x 780.00	
9	DS 040 L00 22914B	3,625	17,940.00	23.00 x 780.00	
10	DS 040 L00 22916B	3,625	17,940.00	23.00 x 780.00	
11	DS 040 L00 22917B	3,646	17,940.00	23.00 x 780.00	
12	DS 040 L00 22918B	3,647	17,940.00	23.00 x 780.00	
13	DS 040 L00 22919B	3,647	17,940.00	23.00 x 780.00	
14	DS 040 L00 22920B	3,643	17,940.00	23.00 x 780.00	
15	DS 040 L00 22921B	3,655	17,940.00	23.00 x 780.00	
16	DS 040 L00 22922B	3,637	17,940.00	23.00 x 780.00	
17	DS 040 L00 22923B	3,640	17,940.00	23.00 x 780.00	
18	DS 040 L00 22925B	3,653	17,940.00	23.00 x 780.00	
	TOTAL	65,478	322,920.00		

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

Columbia Geosystems' computerized database program controls all inventory for production rolls and QC/QA data. Our customers will receive the following standard documentation covering all pertinent information for the project unless otherwise requested.

#1 SHIPPING PACKING LIST (Bill of Lading)
This list contains nominal thickness, resin code, a five digit roll number, roll weight, square footage and dimensions. The Shipping Packing list was designed to assist our shipping department in quickly viewing nominal thickness and resin code against ordered materials. The Q.C. stamp indicates that our Quality Control Department has inspected the load for any damage and verified the correctness of the loaded material.

#2 POLYETHYLENE CERTIFICATE OF ANALYSIS
This certifies the relevant test methods, resin specifications, resin supplier lot number, Columbia's internal resin batch designation number and resin test results as verified in our laboratory.

#3 GEOMEMBRANE CERTIFICATE OF ANALYSIS
This certifies the test methods, test values and test frequency for the geomembrane.

#4 GEOMEMBRANE STANDARD TESTING CERTIFICATION
This provides a listing of test roll numbers and all relevant test results from our laboratory. Each test roll certifies manufactured rolls based on nominal thickness and full-length rolls. Columbia's test frequency is based on a maximum of 50,000 ft^2 rounded to the nearest full roll.

- For 20 mil – the test roll will certify itself.
- For 30 mil – the test roll will certify itself and the **preceding** roll.
- For 40 mil – the test roll will certify itself and the **preceding** two rolls.
  Example, test roll 21755B will certify itself and 21754B & 21753B.
- For 60 mil – the test roll will certify itself and the **preceding** three rolls.
- For 80 mil – the test roll will certify itself and the **preceding** four rolls.
- For 100 mil – the test roll will certify itself and the **preceding** four rolls.

The test results, where applicable, will be recorded as average values.
The roll numbers on the test certification can be deciphered as follows:

Example: 623A00-42355
623A00-21755B

Where 623 = Columbia's internal resin batch designation.
A00 = shift designation and year of production.
42355 = consecutive roll number produced on Line A.
21755B = consecutive roll number produced on Line B.

Note: Roll numbers that appear on the Geomembrane Standard Testing Certification may not appear on the Shipping Packing List. This is due to a Test Roll certifying an actual shipped roll which falls within its testing group.

Columbia Geosystems Ltd. 1415 – 28 St. N.E., Calgary, Alberta T2A 2P6 Tel. (403) 273-5152 Fax. (403) 235-6864

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

POLYETHYLENE CERTIFICATE OF ANALYSIS

Project : 125-01-08
Customer : NORTHWEST LININGS TYPE: PHILLIPS

Project Name : ASARCO INC, RUSTON, WA

Columbia Ref : 125-01-08
We hereby certify that the polyethylene resin for the above identified shipment, meets or exceeds Columbia Geosystem's specifications, below. Testing was performed on each resin blend.

Melt flow index was determined according to ASTM D 1238. Density was determined according to ASTM D 792/1505. Where appropriate, carbon content was determined according to ASTM D 4218. The average test results are listed in the table below.

RESIN SPECIFICATIONS

Melt flow index	1.0 g/10 minutes Maximum
Density - HDPE	0.930 g/cc Minimum
Density - LLDPE	0.926 g/cc Maximum

Lot Number	Columbia Batch #	Melt Flow Index g/10	Density g/cc	Carbon Content %	OIT Min.
8201613	758	0.059	0.936	N/A	N/A
7191828	760	0.063	0.936	N/A	N/A

Adolf Pa
Q.C. TECHNICIAN

Mar 14|2001
DATE

Page 1.1

Chevron Phillips Chemical Company LP

Houston Chemical Complex
P.O. Box 792, Pasadena, TX 77501

January 15, 2001

PSN# 1212-01

FAX: 403-235-6864

Columbia Geosystems
1415 28th Street N.E.
Calgary AB, Canada T2A 2P6

Greg Sharrun

This letter will certify that the Marlex* resin shown below, as supplied by Chevron Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-400G
Lot Number:	8201613
P.O. Number:	6791
Date Shipped:	01/15/01
Package:	PSPX 2568
Quantity:	181250 LBS.
HLMI Flow Rate, ASTM D1238:	10.5 G/10 MIN
Density, ASTM D1505:	.937 G/CC
Melt Index, ASTM D1238:	.060 G/10 MIN
Production Date:	11/04/00

Paul S. Newbold
Sr. Certification Systems Specialist

For COA questions call Carol Meza, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

CGL BATCH # 758

A/L

Chevron Phillips Chemical Company LP

Houston Chemical Complex
P.O. Box 792, Pasadena, TX 77501

January 22, 2001

PSN# 1790-01

FAX: 403-235-6864

Columbia Geosystems
1415 28th Street N.E.
Calgary AB, Canada T2A 2P6

Greg Sharrun

This letter will certify that the Marlex* resin shown below, as supplied by Chevron Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-400G
Lot Number:	7191828
P.O. Number:	6791
Date Shipped:	01/22/01
Package:	PSPX 2421
Quantity:	182450 LBS.
HLMI Flow Rate, ASTM D1238:	10.0 G/10 MIN
Density, ASTM D1505:	.938 G/CC
Melt Index, ASTM D1238:	.080 G/10 MIN
Production Date:	12/19/99

Paul S. Newbold
Sr. Certification Systems Specialist

For COA questions call Carol Meza, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

CGL BATCH # 760

A/L

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

GEOMEMBRANE CERTIFICATE OF ANALYSIS

Customer : NORTHWEST LININGS

Project Name : ASARCO INC, RUSTON, WA

Columbia Ref # : 125-01-08

We hereby certify that the polyethylene geomembrane for the above-identified shipment meets or exceeds Columbia Geosystems' specifications below. Testing was performed at the indicated frequency.

Columbia Geosystems' manufacturing lines are equipped with spark testers for pinhole detection. The raw polymeric material is first quality polyethylene resin.

HT401 DOUBLE-SIDED GEOMEMBRANE SPECIFICATIONS

Property	Test Method	Test Value	Test Frequency
Thickness (ave)	ASTM D5199	40 mil	Per roll
Thickness (min)		36 mil	
•Lowest individual of 25 values			
Tensile Properties	ASTM D638 Type IV		53,820 ft²
•Yield Strength	(2 ipm)	2100 psi(84 lb)	
•Break Strength		1500 psi(60 lb)	
•Yield Elongation	(1.3" GL)	10 %	
•Break Elongation	(2.0" GL)	100 %	
Tear Resistance	ASTM D1004	700 ppi(28 lb)	53,820 ft²
Puncture Resistance	ASTM D4833	1500 ppi(60 lb)	53,820 ft²
Carbon Dispersion	ASTM D5596/3015	CAT 1 or 2	53,820 ft²
Carbon Content	ASTM D4218/1603	2 - 3 %	53,820 ft²
Dimensional Stab.	ASTM D1204	+/- 2.0 %	Resin Batch
Density	ASTM D792/1505	0.940 g/cc	Resin Batch
NTCL, single point	ASTM D5397 (App)	200 hours	Resin Batch

Adolf Vaz
Adolf Vaz
Quality Control Supervisor

Mar 14/2001
Date

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

GEOMEMBRANE STANDARD TESTING CERTIFICATION

PROJECT # 125-01-08

Roll Number	Thick Min mil	Thick Ave mil	Density g/cc	Carbon Cont. %	Carbon Disp	Stress Yield MD psi	Stress Yield TD psi
758C01-22908B	38.0	44.7	0.945	2.51	CAT 1	2576	2720
758C01-22911B	38.0	43.6		2.34	CAT 1	2544	2691
758C01-22914B	39.0	43.2	0.945	2.52	CAT 1	2548	2708
760B01-22917B	39.0	45.1		2.43	CAT 1	2765	2819
760B01-22920B	39.0	44.9	0.947	2.47	CAT 1	2739	2871
760B01-22923B	39.0	45.3		2.39	CAT 1	2743	2946
760B01-22925B	39.0	43.6	0.947	2.83	CAT 1	2804	2898

Page 1.1 Cont...

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

GEOMEMBRANE STANDARD TESTING CERTIFICATION

PROJECT # 125-01-08

Roll Number	Stress Break MD psi	Stress Break TD psi	Strain Yield MD %	Strain Yield TD %	Strain Break MD %	Strain Break TD %	Dimen Stabili MD %
758C01-22908B	3233	2667	16.6	12.9	479	416	-0.24
758C01-22911B	3011	2351	16.9	13.8	431	253	
758C01-22914B	3087	2334	16.1	13.5	445	201	
760B01-22917B	3354	2797	16.7	14.4	446	370	-0.13
760B01-22920B	3379	2714	15.9	13.4	514	399	
760B01-22923B	3428	2948	15.9	13.6	535	494	
760B01-22925B	3541	2830	16.2	12.6	536	386	

Page 1.2 Cont...

SERROT INTERNATIONAL, INC.

Columbia Geosystems Ltd., a subsidiary

GEOMEMBRANE STANDARD TESTING CERTIFICATION

PROJECT # 125-01-08

Roll Number	Dimen Stabili TD %	Tear Resist MD ppi	Tear Resist TD ppi	Punct Resist ASTM ppi
758C01-22908B	0.04	952	861	2230
758C01-22911B		951	865	2300
758C01-22914B		965	879	2265
760B01-22917B	0.11	1008	916	2345
760B01-22920B		963	896	2270
760B01-22923B		960	909	2320
760B01-22925B		941	900	2395

Adolf Nor

Q.C. TECHNICIAN

Mar 14/2001

DATE

Page 1.3

AMOCO FABRICS AND FIBERS COMPANY
900 Circle 75 Parkway, Suite 300
Atlanta, GA 30339
PH: (770) 984-4444 (800) 445-7732
FX: (770) 956-2430

STYLE 4512

Amoco Style 4512 is a polypropylene nonwoven needlepunched fabric. This engineered geotextile is stabilized to resist degradation due to ultraviolet exposure. It is resistant to commonly encountered soil chemicals, mildew and insects, and is non-biodegradable. Polypropylene is stable within a ph range of 2 to 13, making it one of the most stable polymers available for geotextiles today. We wish to advise that **Amoco Style 4512** meets the following minimum average roll values:

Property	Test Method	Minimum Average Roll Value ENGLISH	Minimum Average Roll Value METRIC
Unit Weight	ASTM D 5261	12 oz/yd^2	406 g/m^2
Grab Tensile	ASTM D 4632	300 lb	1.33 kN
Grab Elongation	ASTM D 4632	50 %	50 %
Mullen Burst	ASTM D 3786	650 psi	4480 kPa
Puncture	ASTM D 4833	195 lb	0.865 kN
Trapezoidal Tear	ASTM D 4533	115 lb	0.51 kN
UV Resistance	ASTM D 4355	70%@500 hrs	70%@500 hrs
AOS	ASTM D 4751	100 sieve	0.15 mm
Permittivity	ASTM D 4491	0.90 sec^{-1}	0.90 sec^{-1}
Flow Rate	ASTM D 4491	65 gal/min/ft^2	2640 L/min/m^2
Permeability	ASTM D 4491	0.30 cm/sec	0.30 cm/sec
Thickness	ASTM D 5199	95 mils	2.40 mm

Amoco Fabrics and Fibers Company manufacturers the nonwoven fabric indicated above. The values listed are a result of testing conducted in on-site laboratories. A letter certifying the minimum average roll values will be issued from the manufacturing plant by the Quality Control Manager at the time shipment is made.

DATE ISSUED: 01/01/98

CETCO LINING TECHNOLOGIES

Certified Properties

BENTOMAT® DN CERTIFIED PROPERTIES

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY $ft^2(m^2)$	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2) min
GCL Grab Strength[3]	ASTM D 4632 ASTM D 6768	200,000 ft^2 (20,000 m^2)	150 lbs (660 N) MARV 37.5 lbs/in (66 N/cm) MARV
GCL Peel Strength[3]	ASTM D 4632 ASTM D 6496	40,000 ft^2 (4,000 m^2)	15 lbs (65 N) min 2.5 lbs/in (4.4 N/cm) min
GCL Index Flux[4]	ASTM D 5887	Weekly	1×10^{-8} $m^3/m^2/sec$ max
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly	5×10^{-9} cm/sec max
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typical @ 200 psf 6,500 psf (311 kPa) typical @ 10,800 psf

Bentomat DN is a reinforced GCL consisting of a layer of sodium bentonite between two nonwoven geotextiles, which are needlepunched together.

Notes

[1] Bentonite property tests performed at a bentonite processing facility before shipment to CETCO's GCL production facilities.
[2] Bentonite mass/area reported at 0 percent moisture content.
[3] All tensile strength and peel strength testing is performed in the machine direction using 4 inch grips per modified ASTM D 4632. Results are reported as minimum average roll values unless otherwise indicated. Upon request, tensile strength can be reported per ASTM D 6768 and peel strength can be reported per ASTM D 6496.
[4] Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5×10^{-9} cm/sec for typical GCL thickness. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.
[5] Peak values measured at 200 psf (10 kPa) and 10,800 psf (517 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

CETCO has developed an edge enhancement system that eliminates the need to use additional granular sodium bentonite within the overlap area of the seams. We call this edge enhancement, SuperGroove™, and it comes standard on both longitudinal edges of Bentomat® DN. It should be noted that SuperGroove™ does not appear on the end-of-roll overlaps and recommend the continued use of supplemental bentonite for all end-of-roll seams.

CETCO®
LINING TECHNOLOGIES

1500 W. Shure Drive Arlington Heights, IL 60004 USA 800.527.9948 Fax 847.577.5571
For the most up-to-date information please visit our website, www.cetco.com
A wholly owned subsidiary of AMCOL International

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TR 401-BMDN

NORTHWEST LININGS &
GEOTEXTILE PRODUCTS, Inc.
"Helping to Protect the Environment"
21000 77th Avenue South
Kent, WA 98032
(253) 872-0244 • (800) 729-6954
FAX: (253) 872-0245
www.northwestlinings.com

PermeaTex™ 4060 Nonwoven Geotextile

PermeaTex™ 4060 consists of nonwoven, polypropylene, needlepunched geotextile products that are recommended for drainage, filtration, separation, and soil reinforcement applications. Specific areas of use are subdrainage under roadways and playing fields, foundations, railway construction, rock buttresses, and slope drains. These geotextile products are resistant to ultraviolet degradation and to biological and chemical environments found in normal soil areas.

PHYSICAL PROPERTY	TEST METHOD	MARV VALUES ENGLISH	MARV VALUES METRIC
Weight (Typical)	ASTM D5261	6.0 oz/sy	203 g/sm
Grab Tensile	ASTM D4632	160 lbs	.711 kN
Grab Elongation	ASTM D4632	50 %	50 %
Puncture Strength	ASTM D4833	90 lbs	.40 kN
Trapezoidal Tear Strength	ASTM D4533	65 lbs	.289 kN
Mullen Burst Strength	ASTM D3786	315 psi	2170 kPa
A.O.S.	ASTM D4751	80 US Sieve	.180 mm
Water Permeability	ASTM D4491	0.24 cm/sec	0.24 cm/sec
Water Flow Rate	ASTM D4491	110 gpm/sf	4480 l/min/sm
Water Permittivity	ASTM D4491	1.60 l/sec	1.60 l/sec
U.V. Resistance (500 Hours)	ASTM D4355	70 %	70 %

- Note: *At the time of manufacturing. Abrasion, wetness, handling, storage, and shipping may change these properties.
- Minimum average roll values are based on a 95% confidence level.

NORTHWEST LININGS &
GEOTEXTILE PRODUCTS, Inc.
"Helping to Protect the Environment"
21000 77th Avenue South
Kent, WA 98032
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FAX: (253) 872-0245
www.northwestlinings.com

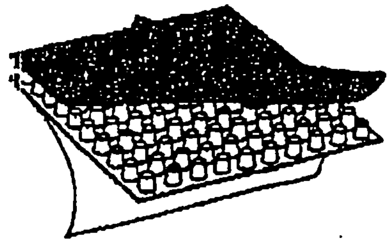
PermeaTex™ 4160 Nonwoven Geotextile

PermeaTex™ 4160 consists of nonwoven, polypropylene, needlepunched geotextile products that are recommended for drainage, filtration, separation, and soil reinforcement applications. Specific areas of use are subdrainage under roadways and playing fields, foundations, railway construction, rock buttresses, and slope drains. These geotextile products are resistant to ultraviolet degradation and to biological and chemical environments found in normal soil areas.

PHYSICAL PROPERTY	TEST METHOD	MARV VALUES English	MARV VALUES Metric
Weight (Typical)	ASTM D5261	16 oz/sy	542 g/sm
Grab Tensile	ASTM D4632	380 lbs	1.69 kN
Grab Elongation	ASTM D4632	50 %	50 %
Puncture Strength	ASTM D4833	240 lbs	1.07 kN
Trapezoidal Tear	ASTM D4533	145 lbs	0.644 kN
Mullen Burst	ASTM D3786	800 psi	5512 kPa
A.O.S.*	ASTM D4751	100 US Sieve	0.150 mm
Water Permeability	ASTM D4491	0.27 cm/sec	0.27 cm/sec
Water Flow Rate*	ASTM D4491	50 gpm/sf	2035 l/min/sm
Water Permittivity*	ASTM D4491	0.70 l/sec	0.7 l/sec
U.V. Resistance (500 Hours)	ASTM D4355	70 %	70 %

- Note: *At the time of manufacturing. Abrasion, wetness, handling, storage, and shipping may change these properties.
- Minimum average roll values are based on a 95% confidence level.

AMERDRAIN® 702 Soil sheet drain



AMERDRAIN 702 sheet drain is designed for trench & French drains, slope drainage, or any other applications requiring a drain allowing water entry from both sides.

AMERDRAIN 702 is a completely wrapped prefabricated soil sheet drain consisting of a formed and punched polystyrene core wrapped with an 8oz. non-woven needle-punched polypropylene filter fabric. The fabric allows water to pass into the drain core. The core allows the water to flow to designated drainage exits. The holes punched in the core allow water enter from both sides.

Typical properties	US	SI	Test method
Fabric properties			
Material	Polypropylene	Polypropylene	
Weight	8 oz/yd^2	270 gm/m^2	ASTM D3776
Grab tensile strength	230 lbs	1020 N	ASTM D4632
Puncture strength	162 lbs	720 N	ASTM D4833
Trapezoidal tear	127 lbs	565 N	ASTM D4533
Mullen burst strength	695 psi	4790 kPa	ASTM D3786
Grab elongation	50%	50%	ASTM D4632
AOS	100 sieve	150 micron	ASTM D4751
Permittivity	1.0 sec^{-1}	1.0 sec^{-1}	ASTM D4491
Permeability	0.20 cm/sec	0.20 cm/sec	ASTM D4491
Flow rate	80 gpm/ft^2	3250 lpm/m^2	ASTM D4491
UV Resistance (retained after 500 hours)	70%	70%	ASTM D4355
Core properties			
Material	Polystyrene	Polystyrene	
Thickness	1/2 inch	12.7 mm	
Compressive strength	15,000 lbs/ft^2	732 kN/m^2	ASTM D1621(Mod.)
Product properties			
Flow capacity per unit width	16 gpm/ft	200 lpm/m	ASTM D4716
Roll length	200 ft		
Roll width	1 ft		
Roll weight	95 lbs	43 kg	

All information, drawings and specifications are based on the latest product information available at the time of printing. Constant improvement and engineering progress make it necessary that we reserve the right to make changes without notice. All physical properties are typical values. Standard variations in mechanical properties of 10% and in hydraulic properties of 20% are normal

AMERICAN WICK DRAIN CORPORATION
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AMER700-0797